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INDICATIONS FOR EARLY TREATMENT OF MALOCCLUSION

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THE title focuses our attention on the various indications of malocclusion in childhood, in the effort to determine whether they are of a nature to indicate or point to the advisability of treatment. To quote from the dictionary, the verb "indicate" means "to point out that certain symptoms indicate certain remedies in the treatment of disease."

Every indication must be weighed in the scales of prognosis before a decision to treat can be reached. A prognosis acknowledges the presence of a positive indication and determines whether a favorable outcome is probable by considering all the surrounding circumstances derived from the personal and family history—even one item derived from that study may contraindicate treatment; for instance, a grave constitutional handicap to growth and development. It is manifestly impossible to include the consideration of prognosis under *this* title because the patient with his history cannot be presented.

No attempt will be made to enumerate all possible indications individually or in combination, nor to assign a relative value of importance. It is unquestionably true that the combination of indications in any single case increases their importance in direct ratio to their number.

The purpose of this study will be better served if, instead of analyzing each so-called indication separately, we agree upon a fundamental base for the appraisal of any suspected occurrence, to which the formula may be applied. That base obviously is our conception of what constitutes the norm in broad terms. The consideration of that demands a "meeting of minds" on a common ground. To establish a common ground for argument two things are necessary: first, an agreement on the major attributes of human dentition which are common to any norm; second, the consideration of the successive steps of growth and de-

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velopment of occlusion from early childhood up to adolescence, all of which must also be correlated with the list of attributes.

The following attributes of human dentition are common to any norm.

1. A full complement of human teeth appropriate to the phase of development.

2. The sequence of eruption of the teeth follows a definite schedule; the date of eruption is variable and less important.

3. A symmetrical arrangement, in three dimensions, of pairs of teeth in the arch curve.

4. The median lines of the incisors coincide with each other and with the sagittal plane of the skull.

5. The form of the arch curve is peculiar to man with diverging lines in the posterior segment.

6. The teeth are in neighborly contact with each other.

7. The buccal cusps of the maxillary teeth occlude buccally and labially to those of the mandible.

8. Each tooth occludes with two teeth in the opposite jaw except the mandibular central incisors and the last maxillary tooth.

9. The incisor overbite is directly proportional to the cusp length of the posterior teeth; the long overbite is found with long cusps.

10. A plane of occlusion in the deciduous and mixed dentition.

11. A curve of Spee in the adult dentition.

12. The mandibular teeth occlude one cusp forward of the corresponding cusps of the maxillary teeth.

The second item for consideration is very difficult to present.

The subject deals with a living, growing organism with constant changes due to growth and development. It follows that the norm is constantly changing and that an analysis of such changes is essential to a conception of a norm for each successive step, which steps merge together without definite lines of demarcation. At this point I wish to refer to a paper I published in the *Journal of the Allied Dental Societies* (**9**: 546, 1914) entitled "A Study of the Physical Development of the Occlusal Curve." A continuation of that study over the subsequent twenty-four years has resulted in the confirmation of the major points and an extension of the knowledge of other details. On that foundation the following brief outline of my present conception of the subject is presented as a basis of analysis of any case within the age limits. For that purpose the child's life is divided into *phases of dentition,* with an added elastic physiologic age (as an aid to visualization only), each phase characterized by its appropriate manifestations of growth and development.

I. *Infantile phase* (from birth to two years) deciduous dentition; growth and development in all three dimensions for the accommodation of the complete deciduous dentition, with a plane of occlusion, conforming to the basic attributes already described.

Little has been written about this phase from the orthodontic viewpoint. "Topsy just growed" is adequate for our purpose.

II. *Early childhood phase* (from two to six years). The attributes of Phase I persist, with an added acceleration of the anteroposterior growth of the jaws in the region of the permanent molar for the accommodation of the first permanent molars.

There is also a marked acceleration of the lateral growth as is evidenced by the widening of the arch curve and the loss of neighborly contact of the deciduous incisors and canines to provide room for the larger permanent incisors.

The distal surfaces of the second deciduous molars are in the same vertical plane, and serve as an index of the anteroposterior relations.

A plane of occlusion is present.

It would be difficult to demonstrate vertical growth, unless as a unit of face and jaws.

III. *Mixed dentition phase* (age six to nine). The acceleration of lateral growth continues, to provide room for the permanent central incisors and the eruption of the lateral incisors and canines.

The anteroposterior acceleration continues in the molar zone. The first permanent molars and incisors erupt.

The plane of occlusion is not disturbed by the eruption of the permanent teeth, since they are in position and function merely as additions to the deciduous dentition, not being fully erupted, nor have they assumed their adult inclinations or occlusal relationships.

The anteroposterior index is that of the previous phase.

IV. *The transition phase* (age nine to twelve). This phase marks the beginning of the change from childhood to adolescence.

Growth and development are more rapid than in any other phase. The width growth continues for the accommodation of the permanent canines and then ceases except for the divergence of the arch curve in the posterior segment. The acceleration of the anteroposterior growth continues in the molar zone in preparation for the coming of the second permanent molars. All this growth is in the molar zone with the resulting changes in all the facial bones moving forward as a unit.

The dominating characteristic of this phase is, however, the rapid and pronounced vertical development of the entire head, face and jaws.

It is extremely difficult to describe the intricate changes of this phase. If you will visualize the contrast between the dentition of the child and that of the adult, with more, larger and differently shaped teeth, arranged in a manner to meet the functional requirements of maturity, it will be easier to understand.

Aside from the increase in the number of the teeth, the most striking development is concerned with the change from the plane of occlusion to the curve of Spee.

The center of activity is in the deciduous molar zone and the detail is repeated as each of the four deciduous molars is exfoliated. Therefore it will simplify matters if we concentrate on these changes during first steps as the maxillary first deciduous molars are lost.

The deciduous molars are exfoliated in succession at intervals of about six months, the maxillary ones before those of the mandible, contrary to the rule of eruption.

The roots of the maxillary first deciduous molar have been absorbed, and the pressure of its successor, the first premolar, causes so rapid and pronounced an elongation as to open the bite appreciably, leaving the other molars without occlusal contact for the time being. This is soon followed by their elongation at a new level. The deciduous molar is exfoliated, and the first premolar takes its place and occludes with the mandibular first deciduous molar. This new level of occlusion is constantly changing as the remaining deciduous molars and the permanent molars go through the same process of repeated elongation.

Another factor of great importance relates to the positions finally assumed by the permanent molars.

Because of the greater anteroposterior diameters of the combined deciduous molars compared to their successors, spaces are left amounting to 1.5 mm. in the maxilla and 3.6 mm. in the mandible, according to Black's tables. These are soon filled by the forward migration of the permanent molars as they also elongate and, for the first time, tip into their adult relations in the curve of Spee.

As the maxillary permanent molar drifts forward, its crown tips distally and buccally, under the influence of the changed cusp relations. The mandibular molar tips forward and lingually. It is only in that way that they can continue the curve of Spee at its same rate of curvature with a proper interdigitation of the cusps and with a normal anteroposterior relation. A curious fact confirms this step: prior to this series of events the first permanent molars are in an end-to-end occlusion.

The maxillary molar migrates 1.5 mm. while the mandibular first permanent molar migrates 3.6 mm. The difference between those figures equals 2.1 mm., which corresponds almost exactly with the distance necessary to bring the anterior buccal cusp of the maxillary molar into occlusion with the anterior buccal groove of the mandibular molar, or its adult relationship.

The curve of Spee is established.

V. *Adult dentition phase* (age twelve to eighteen). Growth and development in this phase exhibit only the final acceleration in the anteroposterior direction in order that the third permanent molars may take their position.

There is, to be sure, a continued consolidation and adaptation of the intricate changes of the previous phases. The second and third molars erupt into a vertical relationship that continues the curve of Spee already established.

Reverting to the list of 12 attributes common to any norm, any indication of malocclusion would logically be a violation of one or more of those attributes. Some of them are so obvious as to need no mention.

Number 3 is very important because it necessitates a careful study of symmetry of pairs of teeth in the arch curve in three dimensions, in relation to the sagittal plane of the skull. Under this requirement the indications would be expressed as asymmetrical relations of one or a group of teeth either laterally, vertically or anteroposteriorly. If the degree of asymmetry is of long standing, its effect is seen in the distortion of the supporting bones and at times of the facial features. The neglect to apply this test makes any diagnosis or prognosis extremely questionable.

Numbers 10 and 11 stipulate a plane of occlusion in the early phases of dentition and a curve of Spee beginning at or about adolescence. If the time element is not adhered to, a definite malocclusion results.

Either a curve of Spee in the earlier years or a plane of occlusion in the adolescent or mature dentition is abnormal and interferes seriously with function.

Number 12 describes the correct anteroposterior relations of the mandible to the maxilla. Violations are found in all Class II and Class III cases, and attention is called again to the diagnostic points which, up to the phase of transition, are based upon the distal surfaces of the second deciduous molars being in the same vertical plane, as distinguished from Angle's classic sign for the adult.

The use of these indices is not conclusive unless there exist similar relations of the buccal teeth anterior to those points. All the buccal teeth must be used in this test to avoid false conclusions caused by drifting away from their correct position in the arch.

All the foregoing established the common ground on which, it is hoped, our minds may meet for the determination of indications for early treatment. The twelve attributes of normality at any age seem to be fundamental and not subject to dispute. There may be others not included.

The different phases of growth and development as briefly outlined are admittedly subject to revision and elaboration as our knowledge expands, or even to contradiction, all of which would be welcome since such changes would make diagnosis more certain. The major points, however, seem to be well substantiated and to justify using them as a basis of judgment. They may not be ignored in the study of cases. The failure of adequate width growth prior to the eruption of the permanent incisors, the inharmony in relative widths of the two arches in all Class II, Class III and crossed bite cases, the failure of the development of the curve of Spee, and many others violate one or more of the twelve cardinal requirements, as well as the time and sequence.

The uncared for, premature loss of the deciduous molars is a major interference with nature's sequence and is bound to result in faulty relationships affecting the incisor overbite, the development of the curve of Spee, and the positions of the molars.

It is to be expected that the earliest evidences of malocclusion will be small departures from normal relationships, even subject to rational interpretations antagonistic to each other. In such cases, because of the acknowledged tendency of malocclusion to grow progressively worse, a series of observations at stated intervals would soon reveal the *trend of growth* and result in a dependable diagnosis.

It is true, however, that even in the deciduous dentition unmistakable malocclusions are not infrequent, such as Class II or Class III (Angle) cases or other gross manifestations. Such early cases are more closely linked in cause and effect with the growth, development, and health of the organic whole. In our field these early phases of our problems have not been the subject of research to the extent that early investigators devoted to adult occlusion. In fact, there seems to be no agreement on even the larger aspects of the successive stages, with the consequent confusion and inability to reach an agreement on diagnosis.

It is true that malocclusion before six years is more frequent than is commonly supposed; however the complications of later life are not so common. It is in this phase alone that we may find a single indication as a rule. Also at this time great care and good judgment must be used in diagnosis before classing it as indicating treatment.

Likewise the analysis of any indications in the early periods of life is conditioned by one's knowledge or ignorance of the fundamental requirements of time, sequence, direction, or amount of growth and development, and the zone in which it should appear.

Failure to recognize and correct the lack of adequate lateral growth before the transition phase, interferes seriously with further development and accounts for a large percentage of the grossly complicated cases of malocclusion later on. The lack of adequate width is the commonest of all the characteristics of malocclusion.

In short, it is axiomatic to say that a malocclusion during any of the early phases should be corrected before the beginning of the following phase. Each phase is the foundation for all succeeding phases. Furthermore, the transition phase may rightly be classed as an inoperable period if forward movement of the incisors is indicated, because the utilization of the molars as anchorage antagonizes their forward migration; and again it is impossible to gain added arch width in the premolar zone because of the instability of the deciduous molars or their successors, the premolars.

If we can agree upon such a common ground as presented or as modified by future consideration, then we shall be in a position to consider critically any individual case that presents indications, because we shall have eliminated much of the confusion attending when there has been no real "meeting of minds."

DISCUSSION

Dr. Abraham Wolfson.—I have enjoyed very much listening to Dr. Delabarre's paper, perhaps because of the very features which have been stressed by Dr. Rogers; namely, the minute details and the carefulness with which growth and development have been observed by Dr. Delabarre.

I have been particularly interested by his enumeration of the twelve attributes for the diagnosis of the status of occlusion at any particular moment, and also by his contribution of the orderly arrangement of time sequence, direction, amount of growth on the zone which we are inspecting, and the conclusions which Dr. Delabarre draws from this careful study; namely, that it would indicate that as malocclusions appear much earlier than we have been accustomed to observing them, it is a clear indication that we ought to treat those cases at those very early stages.

We saw a beautiful illustration of the effect of this approach in a paper which was read yesterday, in which Dr. Hemley pointed out the effect of treatment at early stages of so-called deep overbites, and in which in a group of children between the ages of 9½ and 18 years he showed as a result of treatment by a bite plate an actual increase in the vertical dimension of the posterior teeth. It would seem that Dr. Hemley's work was a natural development of Dr. Delabarre's major thesis. I feel, however, that there is a thirteenth attribute which not only is characteristic of what is happening to the process of occlusion but is equally applicable to what is happening to the growth of the entire body; and that is something which the physicians call nature's effort at remedy. There is a Latin term for it. By that I mean that it is not always true that growth and development occur in quite the mathematical procedure that Dr. Delabarre would like to explain it; that there are situations, quite a few of them, in which although you might expect a certain amount of width at a

certain stage, although you might expect the maxillary molar to occupy a certain position at a certain age, it does not happen at that particular age. I might cite as a practical illustration the failure of sufficient room for a maxillary second premolar. If you observed that situation at a certain stage of development you would, if you were using these twelve attributes as a yardstick, consider it a situation of malocclusion and attempt to move the molar back or the first premolar forward to create sufficient room, yet on more than one occasion both Dr. Milo Hellman and Dr. Mershon have shown that by just leaving those cases alone, sufficient room somehow occurred and the second premolar somehow erupted in its correct position.

Mindful as we ought to be of this so-called thirteenth attribute; namely, nature's own effort at remedying slight defects, and further mindful of the fact that it might be desirable to correct these minute malocclusions if only we could use some extraoral anchorage and apply our force merely to the one little situation without hindering the rest of the arch in its growth, it might be desirable to treat these cases early. But actually most of us have observed this interesting phenomenon: that if we were to select such cases as were presented yesterday, with an apparent lack of vertical growth, and if we merely measured those cases and then did nothing more for twelve months or two years, and then measured them again, we would find that there was an additional vertical growth; consequently, in terms of the twelve attributes, we would be obliged to call those cases malocclusions, and if we were consistent, we would have to treat them; yet if we were patient and waited two years or longer we would find that we did not have to treat them. It is perfectly true that these twelve attributes are desirable. It is perfectly true that there is some sort of time sequence, direction, amount of growth, and zone for all this process of growth, but if we are going to look at these dynamically—and in the process of growth we must be dynamic—we must become aware of the fact that nature does not have a mathematical plan for the exact eruption and position of all the teeth, but rather it has a generalized, unrelated and a very complicated plan; and sometimes it works according to Hoyle and sometimes it does not. Therefore, it seems to me that if we are going to recognize this fact, it would be more discreet to stand off with a great deal of respect for nature, make careful records if we will, take all our measurements, and then sit back and watch to see what nature is going to do. Those of us who have looked at these problems in those terms have found inevitably that there develops a tendency in our practices to treat these cases not earlier and earlier but rather later and later.

Dr. Harry E. Kelsey.—I did not understand Dr. Delabarre's paper to be advocating early treatment of all malocclusions. It was simply indications where treatment might be advisable in certain cases of the child's occlusion. I think that Dr. Delabarre, like all of us, practices the patient waiting period. There was one point in which I was particularly interested. Dr. Delabarre said that the maxillary deciduous molars, contrary to the accepted belief, should be lost first. I know that they are very often, but I am usually alarmed when the maxillary deciduous second molar is lost much in advance of the mandibular, permitting as it does the first permanent molar to bounce forward with that stimulation of the erupting and developing second permanent molar behind it, and put it into that position which to my mind has always been a dangerous one, and one calculated to produce what we call distoclusion or it may be a mesioclusion of the maxillary teeth. When that maxillary second deciduous molar is lost much in advance or even a little in advance of the mandibular, it has been my custom to guard the position of the first molar and keep it from assuming that anterior position because when the mandibular deciduous molar is lost, the occlusion of the first permanent molars has already assumed that relation which we so much dread. I may not have understood him correctly, and I know that Dr. Delabarre will say very justly that the first permanent molars are not in occlusion and that their cusps are not locking in that unfavorable position because they are held somewhat apart; but in the random manner in which civilized deciduous dentitions are lost and permanent ones are acquired, I do not believe that those teeth are often held so far apart that it is not a dangerous factor. That, to me, was one of the points that I should like to hear Dr. Delabarre elucidate just a little bit.

Dr. Leuman M. Waugh.—I very much enjoyed Dr. Delabarre's paper. I think I enjoyed it most because I enjoy Dr. Delabarre as a man very much. I like the approach that Dr.

Delabarre has on this topic because it brings about the development of occlusion—and I want to stress the words "development of occlusion"—as a series of changes: building up first the deciduous, then gradually through the transitional stage, the permanent dentition.

We think of occlusion so much in the abstract. We think of just the cold relationships of tooth structure, and we have been impatient in our evaluation of malocclusions to see everything immediately in contact. As the transitional stage develops, there are those periods when everything seems to be awry, and if one does not remember that there is a gradual series of changes during which and through which the ultimate near ideal or normal for that individual takes place, one is apt to be discouraged. I think that is the approach that we should have for our orthodontic treatment. More and more I think we are beginning to try to learn what should take place normally within certain range periods of growth and development; and, if that does not take place within that range—and there is quite a range, and there is an increased range in certain individuals; twins one much smaller than the other at a certain age but about the same at sixteen, for example—that is the big problem that is before us. It is not how to do it, nearly so much as when to do it. I think that is what Dr. Delabarre has in mind, and I thoroughly agree with what he has said.

I am going to ask Dr. Delabarre one question: He said, in speaking of the degree of overbite, that it is determined by the depth of the cusps of the posterior teeth. He has not considered the inclined plane of the condyle path. We believe that the depth of overbite (that is, the distance that the maxillary teeth are passed down vertically over the mandibular incisors) is due to two factors: One is, as he has said, the depth of cusps of the posterior teeth; the other is the descent of the condyle path. The two, the head of the condyle moving down and the summits of the cusps coming into occlusal contact, or summit contact, combine to form the degree of overbite in a so-called balanced occlusion when the incisive edges of the anterior teeth just clear the maxillary and the mandibular teeth in excursions of the mandible. I want to know whether Dr. Delabarre purposely omitted that condyle path, or whether in writing he just forgot to put it in.

Dr. Delabarre.—It will not take me very much longer to answer that, for I have the answer ready. I want you to appreciate the fact that it is very difficult to picture a growing organism and keep the relationships constantly in mind and the sequence of the different steps. The time element cannot be expressed in rigid terms by any manner of means. I would just as soon attempt to describe the opening of a flower in an acceptable way as to describe the development and growth of the human dentition. It is a difficult task.

The only thing that I feel that I can answer to Dr. Wolfson's question is that I appreciate the addition of number thirteen to that list of attributes: nature's effort to remedy defects. That would, perhaps, better be included in the classification of the prognosis influence rather than the physical influence which the attributes attempt to include.

Answering Dr. Kelsey, universal correction on the appearance of any single attribute is not to be undertaken without serious doubts. I think I cover that when I say each added indication increases the importance of them all individually and collectively. I always look for the second, and the third, and the fourth, and the fifth indication.

Answering Dr. Waugh, I feel that I did not overlook this question of overbite and the relationship of the control of the condyle path in the movement of the mandible. My conception of that situation is this: When we review the way back, cause and effect to growth and development of the different parts of the body, we have a dentition with cusps of a known determined length. We have the excursion of the mandible in function. In the child that excursion is different from what it is in the adult. I maintain that it is the length of the cusp that determines the overbite because the length of the cusp determines the path that the condyle takes in function. The height and angle of the eminentia are determined by the path that the condyle must take as influenced by the length of the cusp, so the length of the cusp is the determining factor. The eminentia is formed only by the repeated excursions of the mandible in whatever path it takes; and, if there is a change in that for any reason, we shall see a change in the eminentia, so it is not the eminentia that determines the path of excursion.

BITE PLATES, THEIR APPLICATION AND ACTION

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In THE specialty of orthodontics, as in all other fields of endeavor, there is a tremendous lag between theory and practice. It is not unusual at the various scientific sessions to hear one paper read purely from the theoretical aspect, to be followed by another purely from the mechanical. As long ago as 1920 Hellman[1] cautioned us that "Orthodontia as a whole can under *no* circumstances be regarded as a problem in mechanics alone. The processes involved in the natural movement of teeth are intimately associated with inherent tendencies of the teeth and their supporting environment." As recently as 1936 before the Great Lakes Association of Orthodontists, Woodbury[2] also made this plea for a closer cooperation between the theorist and the technician. Strangely, Grieve[3] too in the same issue in which the Woodbury article is published makes the plea for a closer cooperation between the theorist and the technician. He says, "Greater progress might possibly result if those men with biological tendency would place a higher value upon knowledge gained through clinical experience, for from this source we have learned considerable." He does not, however, appear to be consistent in this view, since he immediately after attacks mechanical accessories without any explanation whatever and finally ends with a plea for a specific type of appliance. He says for example, "Bite plates have a legitimate place in orthodontic mechanics, but in very many instances are used to spurious purpose. As sometimes applied they act as a camouflaged screen behind which to hide, for a time, an unsuccessful result. Time does not permit now the discussion of this much abused mechanism. Rarely should a bite plate have an inclined bite surface, because this tends to produce a tipping forward of the mandibular incisors, unless there is an efficient appliance upon the mandibular teeth to prevent this undesirable movement. The bite surface should in most cases be flat." He continues, "Intermaxillary anchorage, introduced by the late Henry Baker, in the form of elastics, is another principle which has been very much abused in the treatment of cases in Class II.

"For ten years now I have been having four premolars removed in quite a number of cases in which I feel that it will never be possible to obtain sufficient growth of the apical base to accommodate the full complement of teeth, and I cannot conceive how any mechanism now in existence can compare with the pin appliance and the U-springs in carrying out treatment where the six anterior teeth must be carried back, most often bodily."

The answer to Grieve is aptly put by Woodbury[2] (p. 984), "What often happens is that the orthodontist does not realize that his procedure is empirical.

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Some one thinks out or stumbles upon a procedure, an appliance, a classification or what not that yields a satisfactory outcome in a few cases. At this stage he too often dreams of universality of application. He may even think that he has solved the orthodontic problem, so he begins to rationalize his procedure, seeking a scientific and philosophic foundation for his course of action. Unfortunately the chances are that he has not had the fundamental training that is essential where evidence is to be weighed objectively. His enthusiasm is apt to run away with his judgment; he becomes an advocate of his idea instead of an impartial investigator of its truth, and so his conclusions are of little worth. His followers are not likely to be more critical than he is, but accept his conclusions at their face value. The foregoing has been pointed out many times in recent years, and there are beginning to be signs of encouragement. More men are taking a realistic view of our field and its problems and are being swayed less by wishful thinking. Nevertheless the present state of our literature and the prevailing atmosphere of our gatherings make it imperative that we continue to remind ourselves frequently that the bulk of our treatment is empirical. With this realization clearly before us there is hope for advance.''

Thus the failure of many mechanical appliances can be traced to lack of understanding, on the part of the operator, of principles involved. Similarly, the operator may find a case of malocclusion gradually improve in spite of the appliance being used.

To recapitulate some orthodontic history, we find that Norman W. Kingsley made the bite plate famous about the year 1880, when he first utilized this device in treatment of the malocclusions characterized by a distal relationship of the mandibular to the maxillary dental arch. The use of the bite plate for this purpose was popularly known as ''jumping the bite.'' There were unquestionably some successes and, of course, numerous failures. Many, if not most, of the failures were undoubtedly due to the fact that Kingsley apparently treated all cases of distal relationship in the same manner, namely, by means of a bite plate. This may have been justified at that time because of insufficient knowledge in those early days.

The intermaxillary elastics introduced by Baker offered a new means of treatment, and we find the bite plate thereafter became less and less popular. The intermaxillary elastics unquestionably solved the problem of treatment in many cases. Many failures, however, still occurred for exactly the same reason noted before; again there was an attempt to correct *all* cases of distal occlusion with one device, this time the intermaxillary elastic.

There are many in the field of orthodontics today who advocate the use of the bite plate, while others are as vehemently opposed to its use; also, there are enthusiastic partisans for the intermaxillary elastics, as well as those entirely opposed to their use. It seems to me not unlikely that the criticisms hurled at the use of both these appliances, or often at other accessories in the treatment of malocclusion, are merely expressions of disappointment due to failures in their application. A closer study of the pathogenesis of the case to be treated and the reaction of the tissues to the forces created by these accessories will obviate most of the failures.

Before describing the various types of malocclusion in which the bite plate may be advantageously used, let us review for a moment the manner of development of the alveolar structure itself. We are all aware of the fact that in the infant, before eruption of the deciduous teeth, there is no extensive alveolar structure. With the eruption of the deciduous teeth, bone deposition proceeds rapidly as support for the roots, in consequence of which there is naturally a definite increase in the vertical height of both mandible and maxilla. Likewise, with the eruption of the permanent teeth additional bone growth takes place in order to support the larger dentition. In short, throughout the entire period from infancy until completion of the permanent dentition, we find a definite increase in the amount of bone in the alveolar regions. Indeed, the progressive lengthening of the height of the face is probably to a large extent the result of this growth process around the dentition.

It may be of interest to mention in passing that, as Brash[4] has shown us with his madder feeding on the pig that bone grows in the alveolar regions by surface deposition on the inner surface of the alveoli, so Macewen[5] has pointed out that just this process, a surface deposition and remodelling, occurs in bone growth throughout the entire body.

Let us examine several of the factors affecting growth in the long bones and see whether such knowledge cannot give us an insight into the general problem of bone growth in the facial regions. We shall see later on how this information may influence our judgment in the use of the bite plate. For the moment, however, let me quote rather extensively from Macewen, a noted authority on the subject of bone growth. "The existence of cartilage at the epiphyseal plates is evidence of the continued growth of bone at that part. Freedom from undue pressure, one of the conditions necessary for active osteoblastic proliferation, is obtained at the epiphyseal lines, where the osteoblasts have room to grow and where they receive abundant pabulum to stimulate their increase, their growth at this part being regulated and ordered by the ossifying cartilage, while the limiting membrane—the periosteum—keeps it within the confines of the shaft. If similar conditions obtained in other parts of the diaphysis, osteoblastic proliferation would ensue toward the part where pressure resistance was least. If an hiatus in the shaft occurred, osteoblastic proliferation would tend to fill it up, and if the periosteum were removed over the surface of a gap in the shaft the uncontrolled proliferation might be so great as not only to fill the gap but to form a node or callus-like mass on the outside. The growth occurring at the normal epiphysis is governed by inherent heredity; that taking place to fill a gap is not so governed and may be irregular in form, dependent on the local conditions.

"When the cartilage at the epiphysis disappears, solidification follows, after which epiphyseal proliferation is retarded or arrested. The physical conditions apropos of increased osseous proliferation at the epiphyseal lines and at other parts of the diaphysis then become equal. Before the occurrence of synostosis at the epiphyseal lines, the increase in linear extension would likewise cease if external pressure prevented its expansion. When such pressure is exerted, the inherent, proliferating power of the diaphyseal osteoblasts being checked, it occa-

sionally shows itself in other directions, such as in increased diaphyseal thickening from interstitial growth, or lengthening of the bone in the opposite direction to that of the fixed diaphysis, interfering with the alignment of the articular surfaces or in bending of the shaft.

"Were the epiphyseal plates of cartilage removed, the osteoblasts from the preexisting ossified diaphysis, being relieved from confinement, would pour out from the freshly sectioned shaft into and through the gap, and fresh bone formation would ensue and continue to augment until solidification caused soldering of the freshly formed bone to the shaft and the epiphysis. Small diaphyseal grafts, when placed in a gap in the continuity of bone, show active proliferation from the whole circumference, each piece being an ossifying center from which osseous tissue is thrown out sufficient to fill the gap between the various fragments and to unite them together along with the two ends of the divided shaft. Under suitable surroundings the vegetative capacity of the osteoblasts is at least as great as any of the tissues in the body, and bone proliferation takes place from its whole surface circumferentially, while epithelium for instance proliferates only on the flat."

In short, Macewen tells us that the epiphysis at each end of the long bones furnishes conditions suitable for increase in length of the bone, and that the epiphyseal cartilage not only separates the epiphyseal end from the diaphysis but also serves to create an area of diminished resistance, in that the cartilage acts as a shock absorber. It acts further in supplying a pabulum particularly suitable for added bone growth. Finally, when there is synostosis with complete elimination of the epiphyseal cartilage, there can be no further increment in the length of the bone, because the area of diminished resistance has been eliminated. In other words, there is now no site in the long bone which is particularly favorable to the deposition of bone cells, and hence bone growth becomes arrested.

With these facts in mind, let us examine the oral cavity to determine the effects on alveolar bone growth produced by the creation of an area of diminished resistance. Such an area of least resistance is in fact created by the bite plate which keeps the posterior teeth free from occlusion.

Regarding the question whether or not we can initiate growth in the alveolar regions, or can merely guide the direction of growth, Mershon[6] claims that (p. 582) "Bone is built as a result of growth. Stimulation can affect the direction of growth, but it cannot produce growth. Growth, whether of bone or any tissue, is an intrinsic property of the organism. Bone is constantly going through a tearing-down and rebuilding cycle. It grows in this way and repairs in this way. It has great power of repair, but there is a limit to the changes which can be made in bone."

But what are these "limits" to bone growth? With regard to the dentition and the alveolar regions, we know that the teeth, deprived of antagonists, "seek occlusal contact." Moreover, when this occurs the teeth in question do not grow out of their alveoli, but the alveolar structure grows into the gap and carries the teeth along. The factors involved in this process were described by Landsberger[7] in 1924. An illustration of this phenomenon is clearly discernible in Fig. 1,

We must not, however, overlook the fact that bone structure formed in this manner as a result of lack of occlusal contact, may differ from bone subjected to normal functional stress. It will be recalled that the researches of Oppenheim, Kellner, and Kronfeld have unmistakably shown that around the functioning tooth there is "well-developed alveolar bone and supporting bone,"

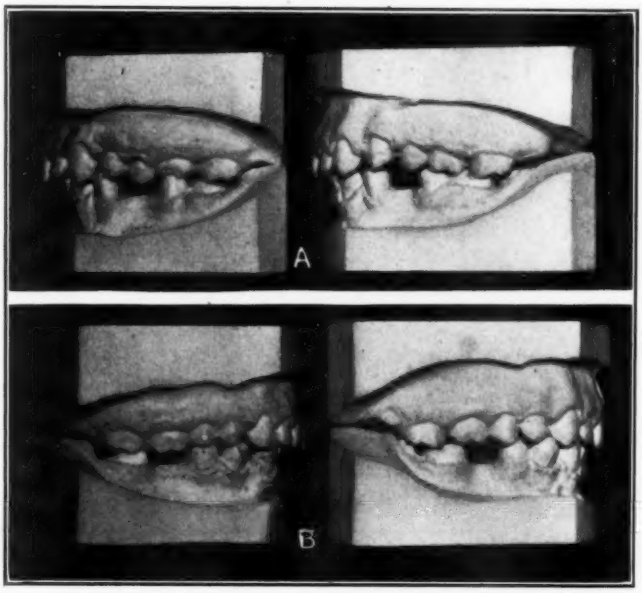

Fig. 1.—The maxillary left second premolar (*A*), and the maxillary right first molar (*B*) before and after depression.

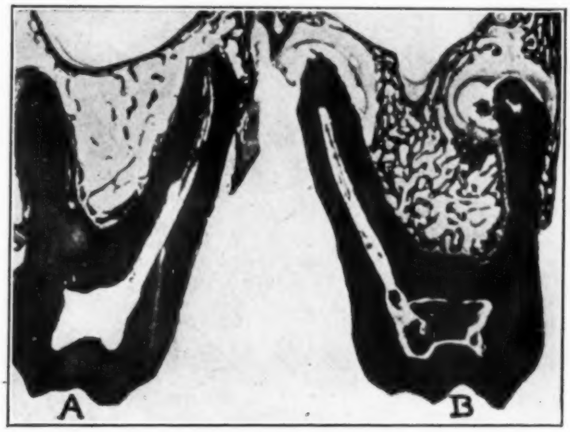

Fig. 2.—The maxillary first molars in frontal section; (*A*) nonfunctioning, (*B*) functioning side. (From Oppenheim, after Kellner.)

while about the non-functioning tooth the alveolar bone has become "thin," "the supporting bone has almost entirely disappeared and is replaced by fat marrow" (Fig. 2). This phenomenon is manifestly a matter of good fortune for the orthodontist when he wishes to depress teeth which have lengthened as a result of lack of occlusion.

Any condition in which there is a disturbance in the relative amount of pressure which should prevail at the time of eruption of the permanent molars

and premolars will undoubtedly affect the amount of growth of alveolar bone in these regions. If there is excessive pressure, there will be a lack of alveolar bone growth vertically. This lack of alveolar growth in the posterior regions would be the result either of hypertonicity of the muscles or of the fact that the developing bone cells are incapable of withstanding normal pressure, or a combination of these two factors.

The incisor teeth in these cases, however, will continue to grow up to and in some instances past the occlusal plane; this is possible because of their wedge

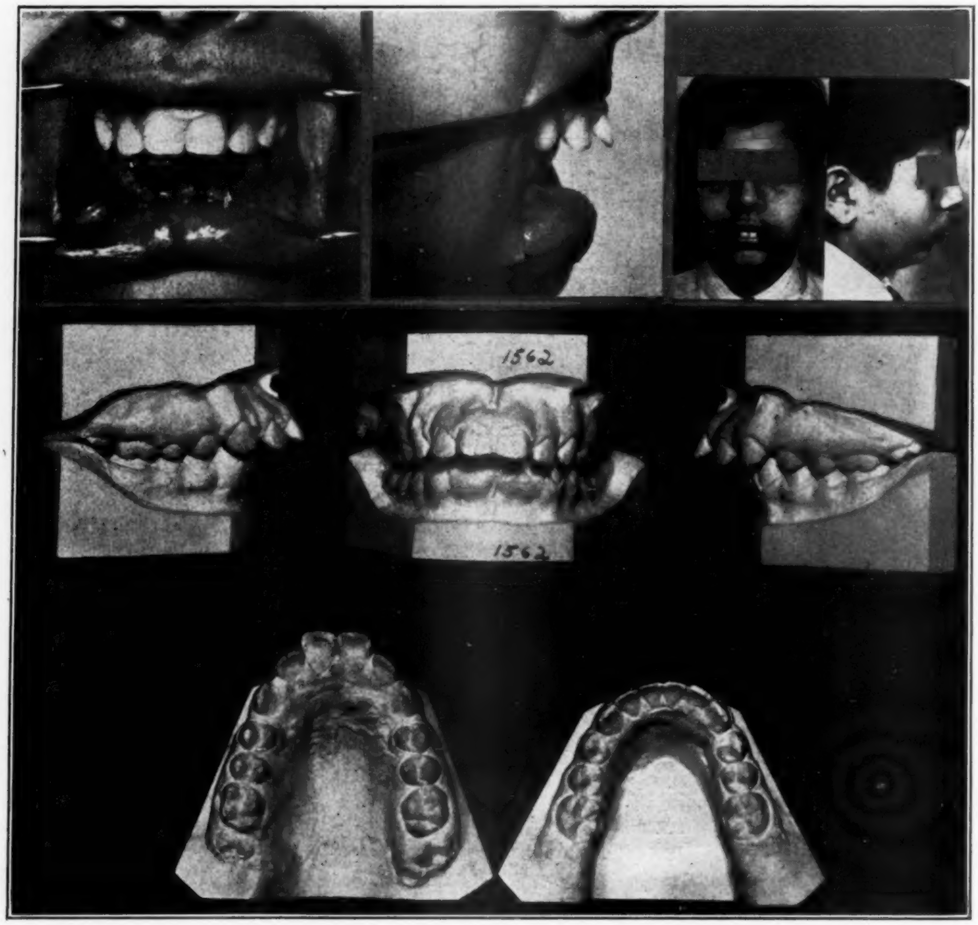

Fig. 3.—Full face, profile, tooth views, and cast of an atypical Class II, Division 1, before treatment.

shape. Furthermore, the continued eruption of the incisors causes a break in the continuity of the approximal contact points between the mandibular canine and first premolar. When the incisors meet, moreover, the bone structure which supports them readily yields, the mandibular incisors being forced lingually by both the pressure of the maxillary incisors and the action of the lips during normal function. The mandibular incisors thus escape from direct occlusion with the maxillary incisors, and the alveolar bone supporting the incisors in each jaw is consequently permitted to continue to develop.

After this theoretical discussion of bone growth in general and its relation to the alveolar regions in particular, we may continue with the problem of the bite plate. I wish to make it clear that I shall not attempt to show the exact stages at which the bite plate should be used, or go into the question of the use of any particular kind of appliance before or after the bite plate; but I shall limit myself, first, to a description of the types of cases which exhibit a need for increase in alveolar bone structure, second, the diagnostic points to be observed in this connection, and finally, the tissue reactions which occur during the use of the bite plate.

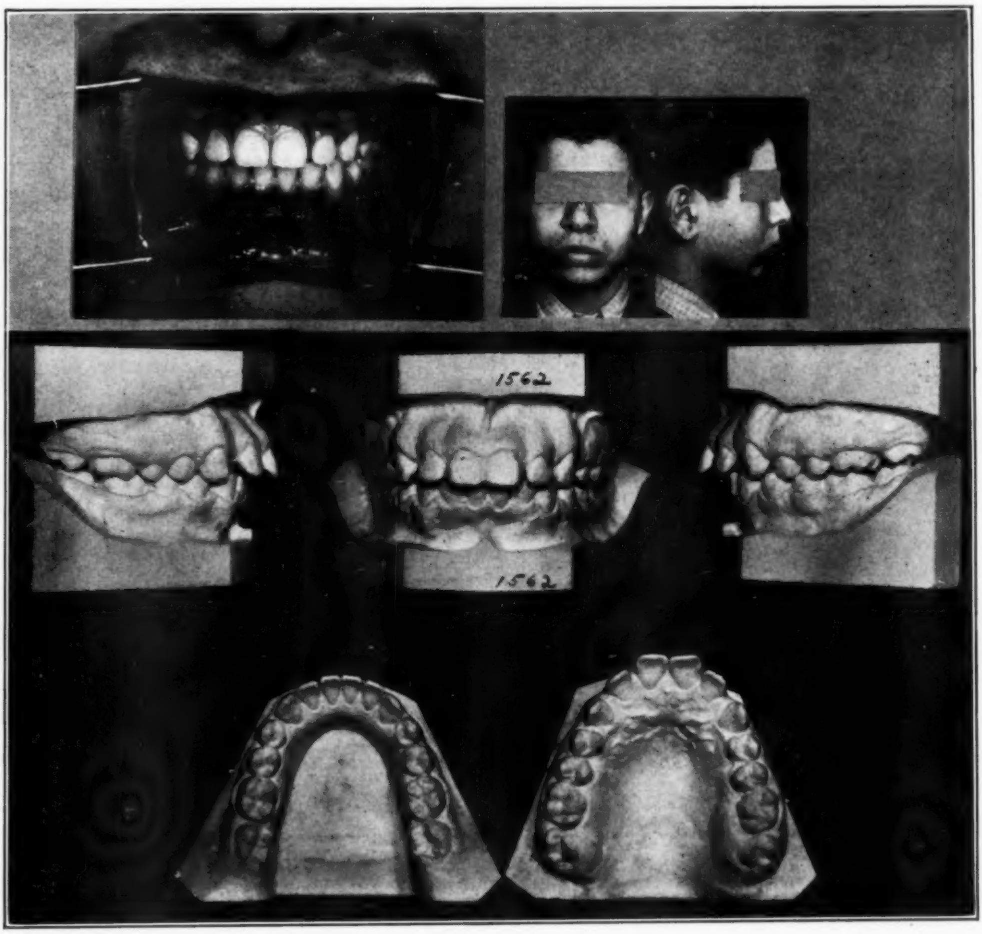

Fig. 4.—Full face, profile, tooth view and casts of case shown in Fig. 3 after eighteen months of treatment.

A careful study of cases described as Class II, Division 2, will show a relative hypertonicity of the muscles in and about the oral cavity. To be sure, we have come to assume that there must always be a retrusion or lingual tipping of the maxillary and mandibular anterior teeth in these cases. Is it not possible, however, that a similar condition resulting in insufficient alveolar bone structure posteriorly may be associated with protrusion or labial tipping of the maxillary and mandibular anterior teeth? (Figs. 3 and 4.) We may still have the same disparity between the amount of force exerted by the muscles and the ability

of the bone structure to withstand that force, even though another etiological factor, such as thumbsucking, lip sucking or lip biting, may be involved.

Indeed, these Class II cases, because of the fact that there is a labial tipping of maxillary and mandibular anterior teeth, might readily be mistaken for the typical Class II, Division 1. Such conditions are actually also evident in some Class I cases. In any event, if lack of alveolar growth posteriorly is associated with this vertical growth in the incisor region, with consequent excessive overbite, it becomes pertinent to determine if application of the bite plate would stimulate growth of alveolar bone structure in the posterior regions. For this purpose it is important to distinguish the typical from the atypical Class II, Division 1.

In the typical Class II, Division 1, we find in the mandible a mesial tipping of the mandibular molar and a distal tipping of the mandibular canine with the two premolars locked below the line of occlusion (Fig. 5). These conditions create an exaggerated curve of Spee. By standing up the mandibular molar and tipping forward the mandibular canine not only is the vertical height increased, but the two premolar teeth are then free to grow up into the line of occlusion.

Fig. 5.—The exaggerated curve of Spee evident in all typical cases of Class II, Division 1.

Let us note the difference between the occlusal plane in the typical Class II, Division 1 and that which we find in this group of cases in which the excessive overbite is due to insufficient alveolar bone growth in the regions of the molars and premolars. In this latter group, we find no trace of a curve of Spee at all. The occlusal plane is flat (Fig. 6). This may be partially obscured by a mesial tipping of a molar if the second premolar has been lost or locked out of the line of occlusion. The mandibular canine in all these cases will be found to have a mesial axial inclination, as can be noted in Fig. 6*A*. In other words, it will be found that there is ample space anteroposteriorly for the accommodation of all the teeth, and the only factor that is interfering with vertical growth is the disparity between the occlusal force and the ability of bone cells to proliferate under relatively excessive pressure. Relief from this pressure would appear to be the first prerequisite.

But there is some conflict of opinion on the question as to whether additional bone growth is possible in the posterior alveolar regions. Mershon[6] cites Mackenzie, stating that "It is length, size and 'tonicity' of the muscle that maintains the normal length and size of the bones and not the reverse, as is often erroneously taught," Following this, he continues (p. 582), "Nothing known to science except accident, disease, or surgery can increase the length of muscle

after it has reached the fullness of its growth. If muscles could be lengthened, men could be made taller, arms could be lengthened, and one leg could be made longer than the other. Muscles are always dominant over bone; my whole paper is based upon this fact."

There can be no quarrel regarding this statement since the works of Jansen,[8] Macewen,[5] and Mackenzie[9] all bear out the statement. But I feel that Mershon has failed to take into consideration a number of other and vital facts. Mackenzie himself in the statement cited by Mershon emphasizes the condition of *tonicity* of muscle as being of essential importance. May there not be, as I

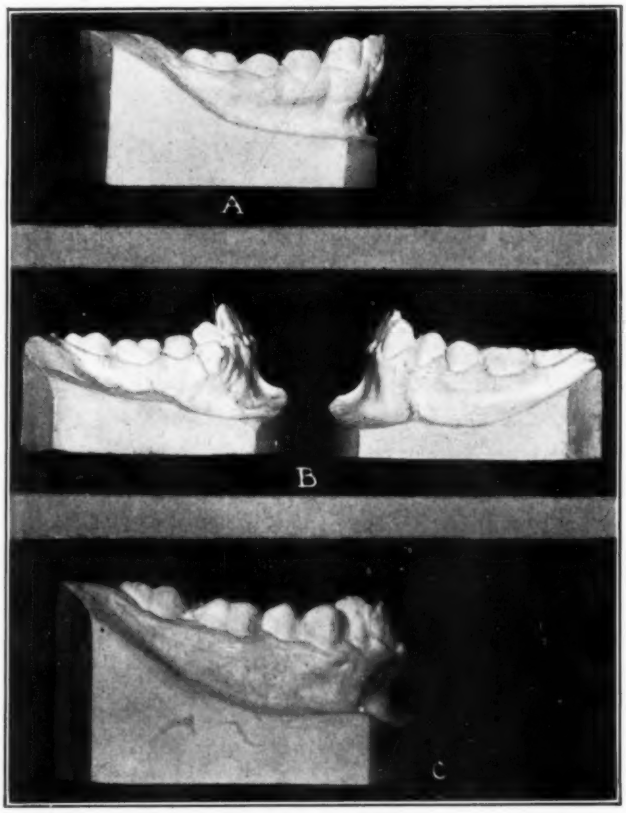

Fig. 6.—*A*, The absence of the curve of Spee in the atypical Class II, Division 1. The lower cast of the case shown in Fig. 3, before treatment.

B and *C*, Typical absence of a curve of Spee in Class II, Division 2. There are two distinct levels, the anterior teeth on the higher level and the posterior teeth on a lower level.

believe there definitely is, in Class II, Division 2, a disparity between bone metabolism and muscle tonus?

Indeed, all texts emphasize the fact that in Class II, Division 2, there is a normal function of the muscles in and about the oral cavity. Strang alone, however, refers to this disturbance in bone metabolism which is apparent in the majority of these cases. In the presence of a normal or relatively normal muscle tonus and bone dyscrasia which renders the structure incapable of supporting the occlusal stress, there is bound to result a disparity between the muscle tonus and the ability of bone cells to proliferate in the presence of this relatively excessive force. In rickets, while tetany is a common concomitant, it does not

always prevail, but there is a marked tendency toward it. When hypertonicity and a bone dyscrasia are coincident, the deformity is much greater than when bone dyscrasia is not accompanied by hypertonicity.

Strang tells us of a Class II, Division 2 case in which he found, "In addition to the abnormal muscular pressure that was influential in retarding and deflecting the growth forces, this child's bone-building metabolism was also far below par." Furthermore, he states that "Fortunately, as the patient grew older, metabolic activities improved and the supporting bones of the denture, together with the environmental muscles, became more stable and coordinated so that the ultimate result was quite satisfactory and has remained so."

While Strang is the only author who mentions the disparity between muscle tonus and the metabolism of bone in regard to his second observation, that normally the metabolic activity improved, he is not entirely alone. Mershon[6] too says (p. 586), "I have observed clinically that, if treatment is instituted *before* maturity, it will frequently have to be repeated, while, if it be done *after* growth is completed, the correction almost invariably remains."

It is my contention that the influence of the hypertonic muscles on the alveolar bone growth can be controlled by the use of the bite plate. The bite plate relieves the strain of this abnormal pressure and thus permits growth. The only reasons that can be given to explain the controversy regarding the value of the bite plate in these cases are the failure on the part of the operator to recognize the lack of vertical growth of alveolar bone, and the lack of understanding of the influence of muscles on bone growth. Equipped with the knowledge of the manner in which bone grows and the influence of muscles on this growth, it is definitely possible to influence bone growth to approximate the normal in these cases. The question may arise as to how to control hypertonicity after bone growth has taken place? In this regard I must again refer to the second observation made by Strang and indeed even by Mershon, that at maturity metabolism is usually more nearly normal and the disparity between muscle and bone disappears. Strangely, the very factor that might interfere with bone metabolism, namely, the disturbance of calcium metabolism, is also the factor that produces hyperirritability or hypertonicity of the muscles. In rickets it is not unusual to find tetany. In the white rat when the parathyroid gland is removed, not only is the metabolism of bone structure altered, but we find that the rat eventually dies in convulsions.

The bite plate permits us to control the hypertonic muscles, with results assured when once bone growth has been obtained and guarded until maturity. We can then feel assured that the growth of the bone will be sustained. Pediatricians and endocrinologists have also observed that metabolic disturbances tend to disappear at maturity. The findings of both Strang and Mershon substantiate the opinion that metabolism tends to approach the normal at maturity.

Another important point to be taken into consideration is the question "Is there a depression of the mandibular anterior teeth as a result of the use of the bite plate?" Indeed, Mershon[6] seems positive on this point, stating (p. 586) that, "The only permanent change which can be brought about by the use of a

bite plate is the depression of the anterior teeth in the alveoli." And shortly following, "The only treatment which I have found successful to the treatment of this condition is the depressing of the lower anterior teeth. When pressure is applied to their occlusal edge, they depress into the alveoli in much the same natural way as when the tongue is held between the teeth."

Our experience at the New York University Clinic does not bear out the above view. In a series of cases in which a bite plate was used, measurements were taken with the sliding calipers to determine the height from the incisal edge of the mandibular incisors to the inferior border of the mandible in the median line, and a similar measurement was taken from the occlusal surface of the mandibular first permanent molar at the junction of buccal groove and the marginal ridge to the inferior border of the mandible. In some of these cases a bite plate only was used, and in other cases a bite plate was used in the maxilla and an appliance was placed in the mandible.

In those cases where an appliance was used, an adjustment was made with the appliance to elevate mandibular molars which had a marked mesial axial inclination. The reaction to the application of a force of this type should be the creation of a force that would tend to depress the mandibular anterior teeth. We therefore will find that in this group we have not only the depressing effect of the bite plate but in addition the reaction from the appliance which tends further to depress these mandibular anterior teeth. The results are therefore all the more remarkable.

The evidence shown in Table I, although not as extensive as might be desired, is still considerable and definite proof that the bite plate has practically no effect whatever on the anterior region of the mandible. In only one case out of twenty-two was there any depression of the mandibular incisor teeth, a loss

TABLE I

DISTRIBUTION AND MEANS OF INCREMENT AND DECREMENT IN THE MANDIBLE AFTER USE OF THE BITE PLATE

INCREMENT OR DECREMENT	HEIGHT OF BODY OF MANDIBLE FROM: LEFT M_1		RIGHT M_1		CENTRAL INCISOR		DENTAL HEIGHT		INFRADENTALE TO MENTON	
MM.	NO.	%	NO.	%	NO.	%	NO.	%	NO.	%
−1	--		--		(1)	4.5	--		--	
0	--		(2)	9.1	(14)	63.6	(2)	9.1	(13)	59.1
1	(8)	36.4	(3)	13.6	(5)	22.7	(2)	9.1	(5)	22.7
2	(5)	22.7	(11)	50.0	(1)	4.5	(3)	13.6	(2)	9.1
3	(8)	36.4	(4)	18.2	(1)	4.5	(5)	22.7	(1)	4.5
4	(1)	4.5	(2)	9.1	--		(4)	18.2	(1)	4.5
5	--		--		--		(2)	9.1	--	
6	--		--		--		(2)	9.1	--	
8	--		--		--		(1)	4.5	--	
9	--		--		--		(1)	4.5	--	
Total	(22)	100.0	(22)	100.0	(22)	99.8	(22)	99.9	(22)	99.9
Mean (mm.)		2.1		2.1		0.4		3.5		0.7

Increment in M_1 region was greater on:

Right side	6 cases
Left side	9 cases
Right side same as left	7 cases

All differences between right and left sides were 1 mm., except one case in which it was 3 mm.

NOTE.—The age of the patients ranged from 9.5 to 18 years. Bite plate was in mouth average of 8.0 months.

of one millimeter. In all the other cases there was usually no change whatever, or occasionally a slight increase in height. Moreover, coincident with this stability in the anterior region, there was both definite increment in the molar region and concomitantly an appreciable opening of the bite in the incisor region.

If the mandibular anterior teeth have not received sufficient stimulation to produce the proper organization of trabeculae, we should find that these mandibular anterior teeth would be depressed. However, as far back as 1907, Angle

Fig. 7.—Microscopic section of three mandibular incisors showing relatively dense bone structure, normal cementum, and periodontal membrane after the patient wore a bite plate eleven weeks.

Fig. 8.—X-ray picture of the teeth and supporting bone shown in Fig. 7.

mentioned the fact that[14] (p. 514), "Unlike the condition of the other division, (Class II, Div. 1), the incisors are less elevated in their sockets (Class II, Div. 2), owing, probably, to their being better able to functionate." In a great many of these cases, we find that the anterior teeth receive ample stimulation to encourage the proper organization of the bone structure to resist occlusal force even though the occlusal relationships are not ideal.

A microscopic study by means of serial sections of three mandibular incisor teeth and their supporting structures after the teeth were subjected to the action of a bite plate for a period of eleven weeks shows no evidence of bone destruction

or of cementum destruction. There is no congestion of the periodontal membrane. The bone structure is at least as dense as that which would normally be expected in a child of fifteen years (Fig. 7). The radiograph of the section before preparation shows further evidence of an unusually dense bone structure (Fig. 8). The cancellous structure is more closely packed than usual and the intratrabecular spaces are unusually small.

The microscopic study was made by Drs. Darlington and Brown of our Pathology Department, and the radiographic report is from Dr. Greenfield of our Department of Radiography.

To return to anterior depression as a result of the use of the bite plate, Jansen,[8] Leriche and Policard,[11] Macewen,[5] Murray,[12] and others who have written on the subject of bone, have all pointed out that functional pressure is a stimulus for the development of bone. Hence when we apply a functional pressure perhaps somewhat greater than normal, as a result the use of the bite plate, but in the direction in which the pressure should normally be applied in accordance with physiological laws, there should not be any bone destruction. Indeed, Jansen has shown in his works "On Bone Formation" that bone will tolerate a tremendous amount of force in the direction for which it was originally built. We have often observed in our patients this ability of bone structure to withstand excessive occlusal force when delivered in the direction of the long axis of the tooth, when there is a tip-to-tip occlusion. In these patients, especially when they have lost many of their posterior teeth, it is not uncommon to find excessive abrasion of the teeth, but we do not find any depression of the teeth. In fact, we have perhaps all had the experience at one time or another of accidentally having applied excessive force to a tooth with a resulting depression. But we have also found with great relief that when the tooth affected was relieved of the excessive force, it immediately went back again to the line of occlusion. This natural resistance to depression and the great difficulty in maintaining the depression when once achieved, seem to have been quite overlooked in the discussion of the bite plate.

It will be recalled that Mershon in the citation above declared that the teeth "Depress into the alveoli in much the same natural way as when the tongue is held between the teeth." It would seem therefore that he considers the lack of occlusion when the tongue is held between the teeth, to be a result of depression of the teeth in their alveoli. A closer analysis will show that in all such cases a lack of occlusion of the anterior teeth is due to failure of the alveolar structure to grow, as a result of the resistance offered by the tongue. If the tongue could be kept away from the teeth and no other factors were present to prevent the teeth from growing into occlusion, we would find that alveolar bone growth would take place in the direction of least resistance, which in this case would be toward the occlusal plane.

While not directly pertaining to the application of the bite plate, I feel under obligation at this time to introduce a subject which is particularly pertinent because of the fact that it is intimately related to the principles of bone growth reviewed above. It is the practice of some orthodontists to prescribe exercises for the stimulation of growth of alveolar bone (Fig. 9), especially

in cases in which there is an excessive overbite because of insufficient alveolar bone growth in the molar and premolar areas. This practice is contrary to all physiological laws regarding bone growth. We have found in accordance with the theories of Macewen and Jansen that bone is stimulated to further growth by pressure, but also that the bone grows in the direction of least resistance. When we wish the growth of additional alveolar bone, we should therefore create a path of diminished resistance in the direction in which we desire additional bone growth. Since the bone structure thus obtained may be deficient in its organization and its ability to resist occlusal force because it has not been subjected to normal occlusal forces, it is advisable to leave the bite plate in position for some time after occlusion of the molars and premolars has been attained. This gives the newly formed bone an opportunity to become properly organized as a result of normal functional pressure. Exercise with the rubber dumbbell may be utilized *after* the bone growth has been stimulated. When used then, the rubber dumbbell exercises may encourage a better trabecularization of the bone structure in accordance with the physiological reaction of bone to external force.

Fig. 9.—*A*, Radiograph shows a tendency toward impaction of the second molar which interfered with the eruption of the second molar.

B, As a result of exercising with a rubber dumbbell to stimulate eruption, the radiograph shows a complete horizontal impaction of the second molar.

I shall now briefly mention some other conditions in which the bite plate might be advantageously employed. Broadly speaking, we might state that the bite plate might be used in any case in which it is desirable to alter the path of least resistance in order to facilitate the growth of bone in the direction desired. The bite plate alone may be used to achieve this effect in some cases, while at times it is possible to obtain better results from use of the bite plate in one jaw and an appliance in the other. Another use for the bite plate not commonly recognized, which I have found very efficacious in some very troublesome cases is the following.

At times in the treatment of a Class II, Division 1 case of malocclusion, where there is a marked mesial axial inclination of the maxillary molars, it is found that the mandibular molars tend to become very loose. This is caused by two opposing forces acting alternately on the mandibular first permanent molar. The mandibular appliance is usually adjusted to elevate or tip upward the mandibular molars, and when the mouth is open, this force acts on the mandibular molars. When the mouth is closed, in mastication and deglutition, the maxillary molars tend to tip the mandibular molars mesially. The occlusal force is so much greater than the force inherent in the appliance that the man-

dibular molar naturally yields to this occlusal force. The result is that a definite jiggling is produced with excessive bone destruction about the roots of the mandibular first permanent molars. In spite of every effort this condition cannot be overcome in some cases. It will be found in these cases that the insertion of a bite plate, while a mandibular appliance is used to elevate the mandibular molars, prevents the occlusal force from interfering with the action of the appliance. If the proper amount of force is used, it will be found that the molars will immediately tighten and treatment can continue toward the correction of the occlusal plane in the mandible. After this has been completed, the bite plate can be discarded and treatment can be resumed without any injury to the bone structure supporting the mandibular molars.

In many cases it will be found that there is a definite improvement in the mesiodistal relationship of the maxillary and mandibular dental arches following the use of the bite plate. This of course is well known. The changes which occur have been interpreted, however, in many different ways by different individuals. For example, LeRoy Johnson[13] says, in this connection (p. 585), "We note at times that following the development of the upper dental arch by means of appliances the lower teeth seem to come from a distal occlusal relation to normal unassisted. Before attributing this apparent readjustment to a change in the temporomandibular articulation we should recognize the fact that such a change in the relation of the mandible to the maxilla is in harmony with normal growth processes. In these cases where the change becomes permanent it is not necessary to assume the forward movement of the condyle in the glenoid fossa."

He continues to say, "That the forward growth of the mandible is a natural process is evident in a study of the embryology of parts."

This readjustment described by Johnson is initiated by an area of diminished resistance. Thus, particularly in cases of Class II, Division 2 malocclusion, the insertion of the bite plate forces the mandible downward and backward, just as in opening of the mouth, thereby creating a space, in a horizontal direction, between the maxillary and mandibular anterior teeth. This in turn serves as an "area of diminished resistance."

To summarize our conclusions:

1. The growth of bone is a natural inherent characteristic of all living bone.

2. Functional pressure stimulates the development of bone.

3. Excessive pressure retards the development of bone.

4. Bone grows in the direction of least resistance.

5. Bone will tolerate considerable force in the direction for which it was normally built.

6. Bite plates can be advantageously employed to alter the direction of least resistance to facilitate the growth of bone in certain regions.

7. A lack of function causes retrograde changes in bone.

8. Function stimulates a reorganization of existing bone to enable it better to withstand pressure.

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DISCUSSION

Dr. Robert Strang.—The subject of bite plates has been very close to my heart for a long time. I think this is the first paper that I have heard in which it was so thoroughly and carefully and scientifically discussed, going far beyond any discourse that I have ever given on the subject. Naturally, the conclusions drawn are very satisfactory to me.

The one thought that comes to me, perhaps, which may be constructive is the necessity of first determining whether or not a bite plate is indicated. This can only be done, as was pointed out by Howard a number of years ago, by studying the patient himself or the photographs of the patient to determine whether or not there is lack of vertical growth below the region of the nose; and if this is present, then the bite plate is indicated.

I have felt from clinical experience that the bite plate really did elevate the molars and produced a growth of alveolar bone in this area; that it had no effect along the line of depressing the incisors, and if that effect was present it was not of sufficient degree to counterbalance the good work that was accomplished by the use of the bite plate. I know of no better way in which the molar area can be increased in its vertical dimension than by the use of this device.

May I also bring to your attention and emphasize the fact that in these cases in which the bite plate is indicated, we are dealing with metabolic processes that are not normal; at least, they were not normal at the time the vertical growth failed to appear. Fortunately, they do become helpful to us to a marked degree by their improvement later in the history of the case. Therefore, it has been necessary for me to maintain a bite plate in position for a long period of time subsequent to the treatment. This is not necessary over the full period of twenty-four hours each day, but after the initial period of retention of approximately one year the plate may be worn by the patient at night only, and thus counteract the effect of the occlusal forces present during the day when the plate is out of the mouth. In these cases we will frequently find the teeth held in position by alveolar bone that is of great bulk, but unfortunately of poor density. The presence of this bone seems to indicate that nature finds herself unable to support the teeth against occlusal stress by dense bone, so has built bulk of bone to do the best she can in the resistance of these occlusal forces.

I was interested in Dr. Mershon's paper on the effect of muscle control and its influence in our treatment of closed bites. My clinical experience does not agree with Dr. Mershon along this line. I have cases in which infraclusion of the molars was present, and a bite plate was used, which show a very satisfactory result after ten and fifteen years of removal of all appliances. Consequently I think that there must be some mode of adjustment of these muscles, perhaps as Dr. Hemley has spoken, in their tonicity, which permits them to allow the occlusal plane to be raised and reach its normal position as indicated by establishing correct esthetic conditions in the mouth.

ORTHODONTIC PROCEDURE BASED UPON A CONSIDERATION OF INDIVIDUAL DIFFERENCES

CHARLES M. WALDO, D.D.S., DENVER, COLO.

IT IS the purpose of this paper to describe certain procedures and certain pieces of equipment which I believe to be of value in the practice of orthodontics. They have to do with the gathering and recording of orthodontic information, and, though they are essentially familiar to all of you, they embody modifications which are calculated to adapt them to the practical application of a viewpoint—a viewpoint based primarily upon a consideration of individual differences. It is in this light that they are significant; therefore I shall first discuss individual differences, their significance to the medical sciences in general and to orthodontics in particular.

By individual differences I mean those differences in characteristics and attributes which are disclosed by a comparison, not of groups of people, but of individuals—differences of structure, function, and response to environment, complicated as they are by still further differences imposed by growth and development. These differences are so numerous and, in many instances, so obvious that their existence can scarcely be denied; yet there are those who prefer to disregard them and others to whom they are merely a subject for speculation, of concern perhaps, to students and research workers, but of little significance to the everyday practice of medicine and its branches. A brief survey of the literature, the activities of research institutions and of various medical and dental groups is sufficient to indicate, however, that there is an increasing number of others who feel that this subject is eminently practical.*

In orthodontics, as in the other medical sciences, it is only in recent years that we have become greatly concerned with the individual. It is true that we have always treated individuals, but in the consideration of our problems we have dealt almost exclusively with that highly theoretical abstraction, the Human Being. There are, of course, a number of very good reasons why we have done so, most of them hinging upon the limitations of our own reasoning powers and the fact that the Human Being is much easier to deal with. His various characteristics can be studied and described rather readily, and he can be made to fit the laws, systems, and mathematical formulas which we devise for him. Individuals are not so easily dealt with. Consequently, the Human Being has been the prominent character in most of the textbooks with which we are familiar, a composite creature, made up for the most part of averages. Our

Presented before the Great Lakes Association of Orthodontists, Cleveland, Ohio, November 2, 1937.

*In this regard the case reports recently inaugurated as a part of the activities of the Great Lakes Association of Orthodontists are an excellent example. They are primarily concerned with individuals and indicate a recognition of the significance of their diverse attributes.

patients sometimes remind us vaguely of him, but he never comes into our offices. He does not exist.

Individuals, however, do exist. They come into our offices every day and we are called upon to treat them. It seems reasonable then that we should think of each patient as an individual, one who possesses a special collection of attributes and who reacts physically and mentally in his own particular way. It is equally reasonable to suppose that we will be most successful if we design our treatment procedures to fit his own particular needs. The question is, "How?" and in the light of the complexities and difficulties which we encounter in thus considering individuals, it is an extremely pertinent one. The answer is suggested by the old adage that we must learn to crawl before we can expect to walk. We know relatively little about individuals, and whatever information we have so far acquired regarding them has proved to be of a decidedly different nature from that with which we are accustomed to dealing. It does not lend itself readily to our present methods of statistical analysis or textbook description and it cannot be summed up concisely. In short, it is decidedly awkward to handle, and to many this is a clear indication of an inherent impracticality.

There is better reason, I believe, to regard these difficulties as an indication of our inexperience. Orthodontics or, for that matter, any of the medical sciences is but in its infancy compared to the science of living, and I should like to call your attention to the remarkable proficiency which we have attained in that general field. Subconscious reactions to differences in the characteristics of the individuals with whom we come in contact are so much a part of our everyday lives, and our thoughts and activities are modified so profoundly and so naturally thereby that we are seldom aware either of the differences, as such, or of our efforts to adjust our lives to them. When we come to think of it, we know that our relations with another person are most likely to be successful when we are able to size him up accurately, that is, to know what are his capabilities and how he is likely to react. We are constantly sizing up people in this way as individuals each of whom is different from his fellows in a number of important respects. That we can do this, often without conscious effort and without the aid of rules or systems, is but a tribute to the oldness of our experience in the art of living. That we can use this procedure in meeting the old familiar problems of everyday life should give us some hope for eventual proficiency in applying it to the relatively new and unfamiliar problems of the medical sciences.

If we admit, then, that this concept of individual variation is of fundamental importance and that there is some hope of eventual proficiency in its application to our practices, an answer to our question, "How?" might be stated in this way: That in general our task is one of learning. We must learn more about individuals and acquire the necessary skill in evaluating and applying what we learn. For this purpose a number of research institutes have grown up in recent years, many of them employing what has come to be known as the longitudinal method of study; i.e., they study relatively small groups of children over long periods of time in contrast to the traditional cross-

sectional method which studies large groups, making single examinations. The longitudinal method centers its attention on the individual, making repeated observations on the same children as they grow and develop, and is especially adapted to a study of individual differences.

The Child Research Council, with which I have been associated for several years, is engaged in just such a longitudinal study; and I shall describe it briefly, touching upon parts that are pertinent to this discussion, but admittedly leaving out much that is interesting and valuable.

The Child Research Council is an independent research institute associated with and occupying quarters at the University of Colorado School of Medicine in Denver. At the present time the staff consists of 22 full time salaried research workers who are trained in their special fields and in the handling of children, and a volunteer staff of 30 members, including leading practitioners of the community and scientists from the faculty of the medical school. They lend their varied knowledge, training and skill to the study of each of one hundred children, making careful observations at regular intervals throughout the various age periods from birth to maturity. At the present time these observations consist of: complete physical examinations; special examinations of the eyes, upper air passages, lungs, heart, bones, muscles, and posture; a thorough dental study; a thorough anthropometric study; photographs of the face and the entire body; x-ray pictures of the head, heart, lungs, sinuses, teeth, long bones and joints, electrocardiographic studies, exercise tolerance and blood pressure investigations, determinations of basal metabolic rate, a study of intelligence and behavior, and a study of the environmental background. Each child is thus followed from birth to maturity, and all relevant details are recorded whether they pertain to health or to disease.

The children who make up this group are selected on no other basis than the likelihood that they will be permanent residents of Denver and available for study over the long period required. They are first seen at the age of two to four weeks, and as far as it is possible to tell at this time they are just average, healthy children coming from homes of various social and economic positions and representing roughly a sample of the population. In other words, they are the sort of children we are accustomed to seeing in our offices.

This study not only is designed to disclose differences in the many attributes of these one hundred children, but it seeks to discover the significance of these variations and to determine which of them are consistent with health.[123] To this end the detailed records which are kept serve a twofold purpose.* At the conclusion of the study they will first be used to determine which of the children observed can be considered to have passed successfully through the various stages of growth and development and to have arrived at a healthy maturity. The records of these healthy individuals will indicate the limits within which variation may occur without necessarily denoting the presence of disease or disorder, and in this way the range of healthy variation may be charted for each characteristic studied.

*A number of examples of individual differences were shown, most of which may be found in the references given.

This research of the Child Research Council and that of a number of similar studies now in progress are thus gradually building up for us a picture of healthy growth and development. These all suggest to us the need for a broader orthodontic viewpoint, one which centers its attention upon the patient rather than upon his malocclusion, and attempts to size him up in the light of his own particular characteristics. In this there are many implications of practical significance to us: that we consider as "normal" not ideals or averages, but those conditions which are consistent with health, both mental and physical; that with the help of the medical practitioner, when necessary, we make our study of each case as complete as possible, attempting to learn more about the characteristics of the patient, seeking to adapt our treatment procedures to his specific needs; that we continue this study throughout the course of treatment, attempting to evaluate the significance of various characteristics, the limitations which they impose, and the effectiveness of our methods of treatment. It is obvious that to do any of these things we need, first of all, information and, second, the means of recording it.

In orthodontic practice we gather information regarding our patients for two purposes, which are often not clearly defined. The first is to assist us in planning and carrying out the treatment of a case, and the second is to help us to learn more about orthodontics. They are equally important in any progressive practice. In other words, not only must we find out as much as possible about each case, but we must record what we find in such a way that it will still be available at a later date. From the standpoint of learning there is much to be said for the routine recording of all pertinent information in the simple cases dependent upon local factors as well as in the difficult ones involving problems of growth. In the first place, apparently simple cases sometimes turn out to be not so simple, and a thorough study may bring to light factors otherwise overlooked. Even though the apparently simple cases prove to be so, they are still decidedly valuable to us as controls. They may, if studied carefully, provide a type of information in which orthodontics has been notably lacking.

Generally speaking, we have recourse to two types of records: (1) written descriptions of our clinical impressions, and (2) the more objective records such as casts, photographs, and x-ray pictures. It is true that written records are our only means of recording much information which is important to us. Records concerning the background of the patient and his family, the patient's history, and many of our clinical observations must for the most part be written ones. I do not mean to minimize their importance by skipping over them, but it is with the more objective methods of gathering and recording information that I am principally concerned. These more objective methods have several distinct advantages. They enable us in a relatively short time to record details that would require a much longer time to write. They record information which we are unable to write accurately even if we had the time, and, what is perhaps most important, they are likely to record information which may be extremely important to us later on, but the need for which we cannot foresee today. In this light they are highly desirable and I want to describe for you

several familiar methods modified to obtain as much information as possible regarding the individual and to do so quickly and conveniently without a sacrifice of accuracy.*

CASTS

The use of gnathostatic casts in a study of individual differences may, at first glance, seem decidedly inconsistent. Certainly, as a part of Simon's gnathostatic system of diagnosis they have received much adverse criticism. It has been pointed out that their making requires too much time, that the procedure is unnecessarily complicated, that they are essentially inaccurate, and that they are part of a rather dogmatic system which seeks a mathematical solution to the problems of treatment. These criticisms are not without foundation; yet there is reason to believe that they are based to a considerable extent upon misconceptions.

Gnathostatics was presented as a system of diagnosis and treatment[4, 5] and as such it has been the subject of much controversy, resulting in the usual two schools of thought; hence many have either accepted or rejected it in its entirety. As a result, criticisms aimed at a part have been unthinkingly attributed to the whole. It seems to me that most of the valid criticisms apply not to gnathostatic casts as a means of obtaining information, but to gnathostatics as a system of treatment.[6, 7, 8, 9] The mistake lies in the assumption that the two are inseparable. We can, I believe, accept a part without accepting the whole and in doing so avail ourselves of a valuable means of obtaining information. In other words, the gnathostatic or related casts may be used only so far as they provide additional information, and not as an attempt to seek a mathematical solution to the problems of treatment. The information which they provide may or may not have a part in determining the course of treatment in an individual case. It may be considered along with that obtained by other means in an effort to learn as much as possible about the factors with which we deal.

When used in this way the related cast has much to recommend it. It is an ordinary cast, plus relatively accurate recordings of: (1) vertical development of the maxilla; (2) the relation of the occlusal plane to a plane of reference in the head; (3) the axial inclinations of the teeth with reference to this plane; (4) the anteroposterior position of the maxillary and mandibular arches with reference to a related plane; and (5) with slight modifications in the technique it will give some information regarding asymmetries. This information must, of course, be considered in the light of its limitations without attempting to read into it more than is really there. The procedures incident to making the casts should be carried out as carefully and skillfully as possible, but we should neither expect nor assume a fine degree of accuracy.

The objection that the making of such related casts requires a considerable amount of time and effort is not founded upon experience. The time required for taking the impressions, setting the face bow, pouring and finishing the casts, and drawing upon them the simple planes of reference is not significantly

*Both the procedures and the equipment described are applied routinely to the study of all cases in the practice conducted by Dr. William R. Humphrey, with Dr. George H. Siersma and the writer as associates. The various pieces of equipment and modifications in the methods used represent the combined efforts of all three.

greater than that required for making ordinary casts if the operator understands what he is doing. The belief that the procedure is complicated and time consuming would seem to be based upon a wrong approach—a centering of the attention on a detailed description of each step in the process without first understanding the fundamental principles involved. With an understanding of general principles as a first step, the mass of detail outlining the gnathostatic method becomes much less formidable and need not be strictly adhered to. It may be used as a guide, that which seems of value retained, the rest modified to suit the operator. The procedure of making the casts then is not a sacred rite, nor is it an end in itself; it is merely a means of securing and recording information and it is the information which is important. In this light the method is a relatively simple one.*

In our practice we carry through the steps involved in locating the landmarks, making the impressions, pouring, trimming, and drawing planes of reference upon the cast. In doing this two modifications of the usual technique are made, both of which tend to disclose asymmetries.

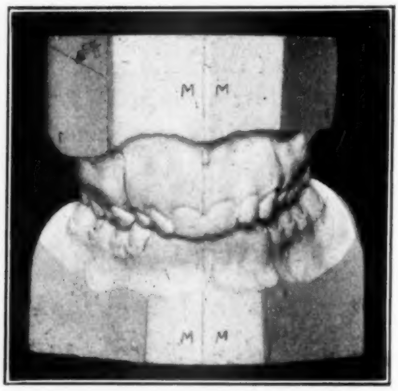

Fig. 1.

1. In adjusting the four pointers of the face bow, the two tragus points and the left orbital point will often determine the horizontal or Frankfort plane leaving the right orbital point below or above the pointer. Slight variations may be due to error in locating the points, but when it consists of 2 mm. or more, the extent of the discrepancy is estimated and recorded on the patient's chart. Such a notation may help to explain the nature of asymmetries such as that shown by the casts in Fig. 1. Simon's method by averaging such variations tends to obscure them. This modification tends to disclose them.

2. Simon's method also tends to obscure variation, since it records two orbital points in the adjustment of the face bow and transfers but one point, an average of these, upon the cast. The line representing the orbital plane is then drawn through this point at right angles to the midline of the palate, an entirely artificial procedure. A worthwhile modification may be made by transferring two points in the orbital plane to the cast, drawing the line

*Moving pictures were used to illustrate the steps involved in making the impressions, setting the face bow, pouring and trimming casts. The procedure is essentially that outlined by Simon[5] with modifications suggested by Dr. James D. McCoy.[10]

through both. Since most heads are asymmetrical to some extent, this plane is not necessarily at right angles to the median line of the palate. The extent and nature of such assymetries will be disclosed.

Both of these modifications in method serve to illustrate a fundamental departure from Simon's philosophy. Simon sought to determine the relation of the dental arches to the mathematically perpendicular planes of an ideal head. We seek to determine their relation to similar planes of reference, but as they exist in an individual.

When used in this way, related casts may give us information which is valuable both in planning the course of treatment and in evaluating the results. They may call attention to conditions which we would not see otherwise and, over a period of time, help us to improve our abilities to observe. An orthodontist with unusually keen powers of observation might conceivably get all the information which the related cast will give, without its aid, but the time and effort required to record it would be prohibitive.

PHOTOGRAPHS

One-fourth life size photographs in profile and full face have come to be accepted in orthodontics. Their uses and their values in providing and recording information are too well known to need further discussion, but the fact remains that in many practices they are not made routinely, and when they are made they are often unsuitable for orthodontic purposes. As most of you know, this was a problem which concerned Dr. Albert H. Ketcham during the last years of his life. He assisted many members of the profession, even constructing clinical camera outfits for them, in an effort to encourage the routine use of good photographs. I had the pleasure of assisting him in this work for several years, and at the time of his death we were well along on a paper concerned with clinical photography and the construction of equipment suited to orthodontic use. This paper was never published, but I should like to quote two paragraphs which Dr. Ketcham wrote as an introduction:

"The problem of securing good clinical photographs is one which causes the orthodontist much concern. If the patient is sent to the photographer, the results are usually disappointing, as the positions and comparative sizes of the photographs are not uniform. When the orthodontist is driven to the task of securing his own photographs, he usually approaches the problem with a knowledge of photography which is summed up by the old Eastman advertising slogan, 'You push the button—we do the rest.' In his ignorance, the orthodontist selects a camera of the kodak variety suitable only for views taken from an adequate distance. With this camera he endeavors to make clinical photographs of acceptable size for diagnosis of facial deformities, with the result that the short distance from the lens to the patient's face produces a distorted image of the features. One can readily visualize this distortion by observing another person's features in the full-face view from a distance of about eighteen inches, first with both eyes open noting the relation of the cheeks to the ears, then closing one eye noting that the cheeks apparently grow larger, partially

obscuring the ears. In the profile view, following the same procedure the cheek and ear apparently increase in size in comparison with the nose. This distortion of the features corresponds to that encountered when using a short focal length lens for photographs of adequate size for diagnosis.

"For clinical study of the patient's head, the majority of orthodontists prefer a photograph of at least one-fourth actual size. For this purpose a lens having a focal length no shorter than ten inches gives a reasonably good perspective."

Dr. Ketcham's observations regarding lenses of short focal length should be an even more timely warning today. There are on the market several cameras designed ostensibly for orthodontic use which are deficient in this re-

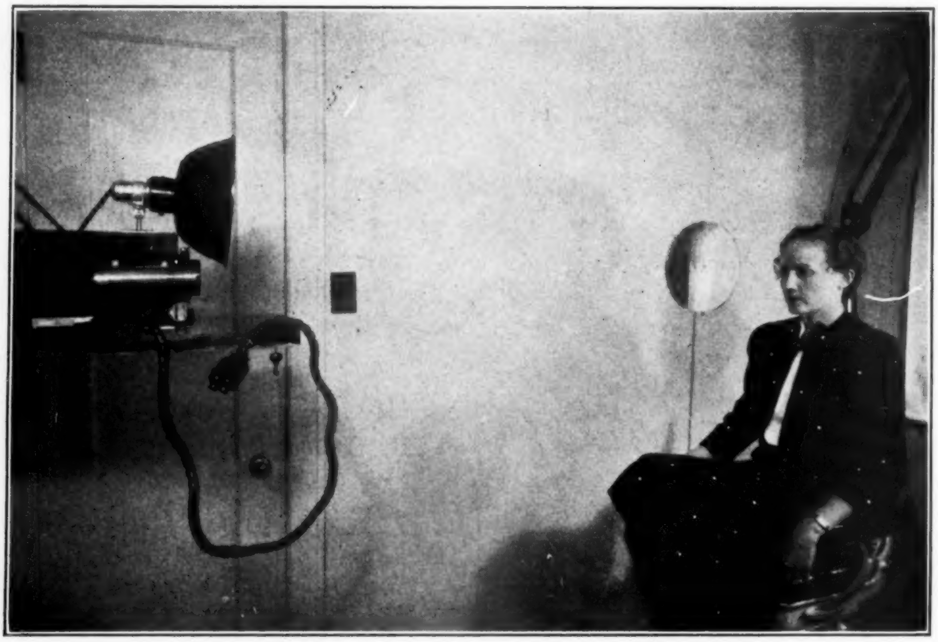

Fig. 2.—Camera and subject in readiness for full face photograph. The camera is mounted on a door which opens from a recess in the wall at the left. Fastened to the camera may be seen the flood light and one of the beam projectors. The cord and switches hung over the end of the door are for electrical control of lights and camera shutter. The mirror at the right of the subject conceals the lateral beam projector which is mounted in the wall, the beam of light passing through a hole in the center of the mirror.

gard, and many of the short focal length lenses commonly offered are definitely unsuitable for one-fourth size pictures. This may be confirmed by the simple expedient of comparing measurements of some structure, say an ear, in both full face and profile views.

A good lens is the first and most important consideration in making photographs for orthodontic use. No amount of time or expense directed to other phases of photographic technique will make up for the inadequacies of a poor lens.

The most frequent reason given for a failure to make routine photographs is that they require too much time. The storage of bulky equipment, the necessity for moving and setting up the camera and background, a lack of standardization of technique, and many other inconveniences are deciding fac-

tors in the omission of photographs in a busy practice. With this in mind, I shall describe a technique which we have developed during the past six months. It is simple, exceedingly quick, makes use of equipment which is easily and cheaply constructed, and produces photographs which are uniformly satisfactory. To save time I shall describe it as it is adapted to the conditions in our office, though with slight modifications it could be adapted to almost any practice.

Most orthodontists are familiar with the photographic equipment described by Simon,[4, 11] using an arm and a nose board for orienting the subject's head and establishing its distance from the camera. The photostatic technique suggested by James D. McCoy[10] and used extensively by Ketcham also used the arm and nose board, and the camera and arm in each case were adjustable to the subject's height. In our method the position of the camera is fixed, the subject, seated in the dental chair, is raised to the proper height and the position of the head determined by projected beams of light falling upon the face. Since the camera once adjusted for sharp focus need not be changed, it con-

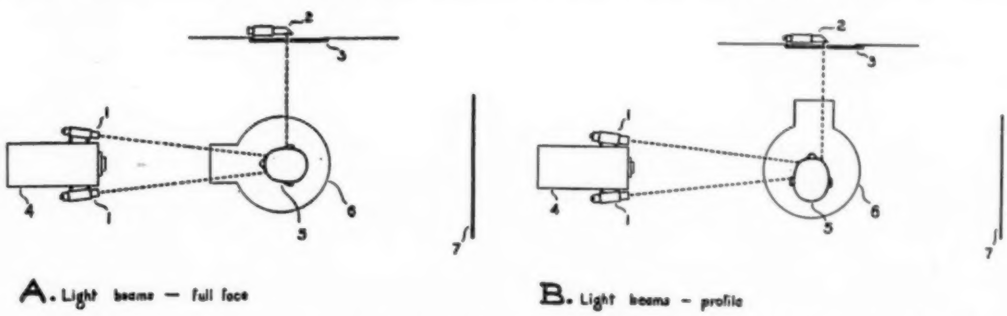

Fig. 3 *A* and *B*.—*1*, Camera beam projectors; *2*, lateral beam projector; *3*, mirror; *4*, camera; *5*, subject's head; *6*, dental chair; *7*, background. Dotted lines indicate paths of light beams.

sists of the simple, rigid, wooden box shown at the left in Fig. 2. The lens, shutter, and lens board serve as the front of the camera, and an old camera back taking 4″ × 5″ film holders serves as the back. Note that the camera is mounted on a small door hinged at the bottom. When not in use it folds into a recess in the wall and when opened is automatically in position for the photograph. The single flood light and reflector used for lighting the face are attached to the camera and are always in correct position. Two small projectors are mounted on the camera, one of which may be seen in Fig. 2, near the front of the camera in line with the lens. A third projector is mounted in a recess in the wall behind the mirror at the subject's right. Beams of light from these projectors falling upon the subject's face produce spots of light about ¼ inch in diameter and serve to orient the head accurately for either full face or profile positions.

Fig. 3*A* shows the relative positions of camera, light beams, and subject seen from above in full face position. The beam at the right of the subject falling on the tragus point places the head so that the image will be in sharp focus and exactly a one-fourth life size; the two beams from the camera projec-

tors falling upon the two orbital points center the image on the film, and all three beams being in the same horizontal plane serve to orient the head to this plane.

Fig. 3*B* shows the same relation of camera and light beams, but with the subject in the profile position. The change is made by merely turning the dental chair at right angles to the former position, the subject facing the mirror instead of the camera. The single lateral beam now falls on the right orbital point, the two camera beams on the left tragus point and on the cheek near the left orbital point. They serve the same purposes as before in orienting the head. In this position the mirror has an added function, since the subject looking into the mirror will almost automatically assume the desired position and maintain it steadily and easily.[12]

The beam projectors used are made from three sections of brass tubing as shown in Fig. 4. Section 1 contains an automobile light bulb socket soldered in place and a 30 candle power bulb having a concentrated filament; section 2, a thin metal diaphragm having a needle hole in the center and held in place by a thin lead bushing; and section 3, a simple biconvex lens also held in place by a lead bushing. The lens used was taken from an inexpensive 7x magnifier of the tripod mounting type manufactured by Bausch & Lomb. The pro-

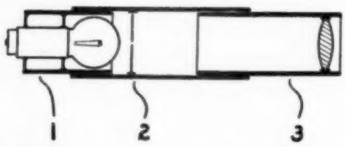

Fig. 4.—Diagram showing construction of beam projector from three sections of brass tubing: 1, contains the light (30 candlepower, concentrated filament automobile bulb); 2, a needle hole aperture in a diaphragm; 3, a simple biconvex lens.

jectors are about 6 inches long, the brass tubing used has a diameter just large enough to accommodate the bulb and lens (about 1⅜ in. for sections 1 and 3). Since the relation of the three elements is variable, the projectors are easily adjusted and the beams focused to give maximum sharpness. A plane dental mirror placed in front of the lens at an angle of 45 degrees will deflect the beam at right angles and permit mounting the lateral projector, as shown in Fig. 3*A* and *B*.

All three projectors are fixed in place and once adjusted need no further attention. They eliminate the bulky arm and nose board and the necessity of moving these before the picture may be taken. Once the head is correctly placed, the exposure may be made immediately before the subject has a chance to move. To facilitate this the light beams, flood lights, and camera shutter are controlled by a switch unit at the end of a long cord (see Fig. 2). This permits the operator to stand beside the subject and carry out the entire procedure except for changing the film. With a cooperative patient a set of photographs may be made in this way in three or four minutes without any necessity for hurrying.*

The system of lighting used is an adaptation of that described by William Mortensen in his book *Pictorial Lighting*[13] and designated as basic light. It

*Moving pictures were used to illustrate both equipment and procedure.

produces sharp outlines, a maximum visualization of contour, and a freedom from confusing high lights and shadows, all of which are desirable for our

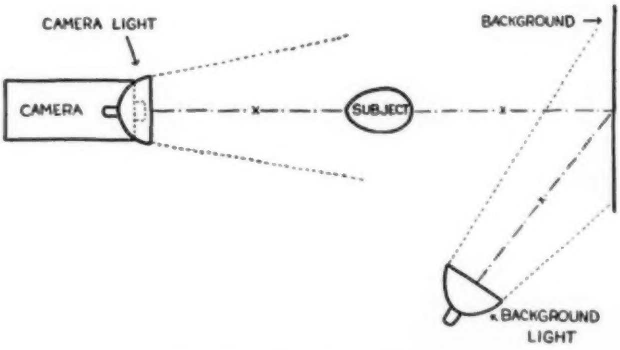

Fig. 5.—Arrangements of lights, viewed from above.

Fig. 6.

Fig. 7.

Fig. 6.—Photographs of subject with fair, smooth complexion, white background brightly lighted.

Fig. 7.—Compared with Fig. 6 this subject has a slightly darker complexion, and the white background is not so brilliantly lighted.

purpose. As shown in Fig. 5, one light is mounted on the camera as near the lens as possible. This is the only light used to light the face. An entirely

separate light is used to light the background, which consists of a white window shade placed several feet back of the patient. The background light is not absolutely necessary, but it eliminates undesirable shadows from the background and gives a sharp outline to the image of the face. None of its rays should fall upon the subject's head.

Figs. 6 and 7 show photographs made by the method outlined. The subject in Fig. 6 has a fair, smooth skin; while the subject in Fig. 7 has a darker complexion, giving a photograph of greater contrast and sharper outlines. In Fig. 6 note the effect of scattered rays from the background light falling upon the top of the subject's head.

Since the position and intensity of the light remain the same, the exposure factors also remain constant, producing uniform results. When the distance from the light to the subject is approximately 5 feet, the following exposure factors, film, and light give satisfactory results:*

Exposure time	½ second
Stop	11
Film	Eastman super speed panchromatic
Light	Filter flood (small size)
Development	40 min. (Eastman DK 76 developer)
Background light	Filter flood (small size)

Note the use of the small filter flood light in combination with panchromatic film. This light is not so bright as a No. 2 photoflood; hence it is much easier to face without squinting and the fast film allows a relatively short exposure. In addition, the filter flood bulb filters out a portion of the red rays, giving a picture with more variation in tissue coloring than is obtained with photoflood lights and panchromatic film.

There is another important combination of factors in the exposure and development of the film. The exposure given, ½ second at stop 11, would, if the film were developed as usual, produce a negative so thin as to be useless. It may be given twice or even three times the normal development, however, and in so doing all the possible gradations in shades of gray are brought out.[13] This gives a maximum of contour and form to the photograph. If the patient has dark hair, it may be noticeably lacking in detail, a defect which cannot be corrected in printing, but which is not a significant disadvantage from our standpoint.

This technique is of value not because it produces better photographs than are possible by other means, but because it produces consistently good photographs having qualities which are desirable for orthodontic use, which can be made accurately and quickly by the orthodontist, unassisted, without upsetting or interfering with the routine of practice. The cost of the necessary materials is not great. The equipment shown, exclusive of the camera lens and shutter, but including camera, beam projectors, two flood lights and reflectors, back-

*Comparable results may be obtained using Eastman Panchropress film (¼ second at stop 11) or Agfa Super press panchromatic film (¼ second at stop 16). Both these films seem to give excellent results.

ground, mirror, and switch unit costs about $25 for materials. The expense of putting together the camera and projectors and mounting the various pieces would depend upon the special requirements of the office and how much of the work is done by the orthodontist himself. The work is not difficult, however, and the expense should not be very great in any event.

I have included this photographic technique as pertinent to a study of individual differences not because it provides more information, but because it should enable the busy orthodontist to make photographic records routinely and at more frequent intervals.

X-RAY PICTURES

In considering the last group of procedures, those having to do with the use of the x-ray, I shall omit a detailed discussion of their value in a study of individuals. It goes without saying that they are extremely important in this regard.

X-ray pictures like casts and photographs are especially well suited to the needs of the orthodontist because they automatically record whatever information they provide. Interpretations may change with progress, but the x-ray film will still contain its original information; that is, it will retain whatever it had in the first place. The intraoral and extraoral views which have been made more or less routinely for a number of years have seemed fairly adequate until the investigations of Becks[16] and others pointed out a need for a better registration of bone detail. These studies have opened up a tremendously interesting and important field for us, and for the most part our films are inadequate. As many of you are doing, in our office we are working to improve our dental x-ray pictures so that they will be more suitable for a study of bone, and though we have made some progress it would hardly justify a report at the present time.

X-ray pictures, however, took on a new and extremely important significance to orthodontics with the introduction of the roentgenographic cephalometer by Dr. B. Holly Broadbent, which gives us a means of visualizing the various parts of the face in their relations to one another, and of measuring changes which occur.

I shall describe a modification of Dr. Broadbent's technique which we now use routinely for making lateral views of the heads of our patients and in so doing I believe it is safe to assume that you are thoroughly familiar with his work. The general principles involved in making the pictures and in their application to orthodontics are essentially the same,[14, 15] and I shall omit a review of these, concerning myself chiefly with a description of the equipment and the special procedures which we use in the making of lateral or profile views.*

The essential requirements for producing cephalometric x-ray pictures are that the x-ray tube, the ear posts which immobilize the head, and the film bear a definite relation to each other. In other words, for the lateral view, the

*Based upon equipment and procedure which have been used at the Child Research Council, University of Colorado School of Medicine, for the past four years.

central ray from the tube should pass through the axes of the ear posts, striking the film at right angles to its surface.

Dr. Broadbent's equipment fulfills these requirements by fixing the various parts exactly in this relation and maintaining them there. The patient is seated in a dental chair which is raised or lowered to place the auditory meati on a level with the ear posts. Our modified equipment fulfills the same requirements, but in a different way as shown in Fig. 8. The patient is seated on an ordinary stool or bench, the unit carrying the ear posts raised or lowered to the level of the auditory meati, and the x-ray tube set at a corresponding level. The mountings of the x-ray tube and the head immobilizer permit this vertical

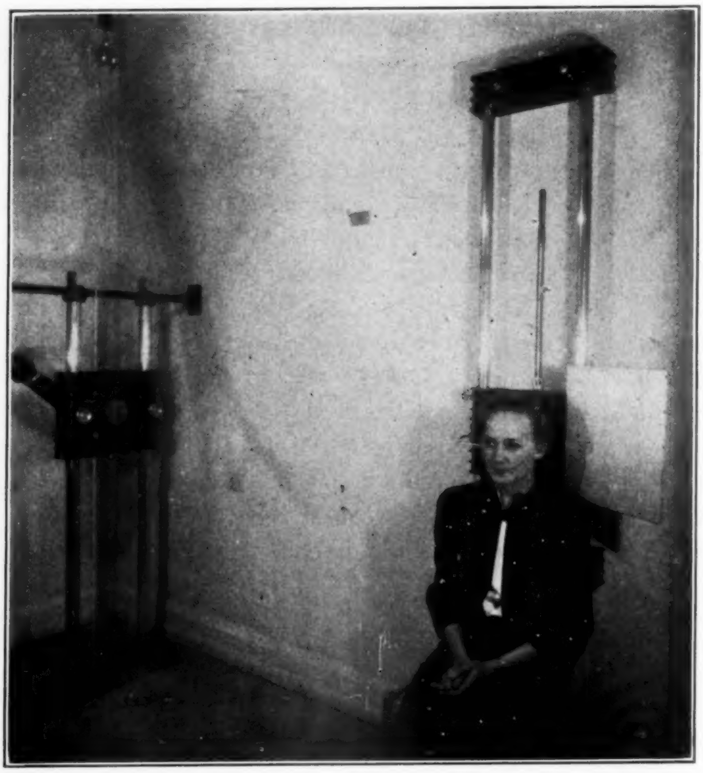

Fig. 8.—Lateral head x-ray equipment with patient seated and ear posts in position. Before the exposure is made, the cassette will be swung into place close to the left side of the patient's head.

adjustment, and when the two are set at the same level the central ray from the x-ray tube passes through the axes of the ear posts. In Fig. 8 the cassette holding the film is swung back to show the left ear and ear post support. When all is ready for the exposure, the cassette swings easily into place against the left side of the head and with its surface at right angles to the central ray.*

The x-ray tube and its mounting are shown at the left in Figs. 8 and 9 (also Number 6, Fig. 11). The mounting consists of two heavy steel tubes supported at top and bottom by iron castings rigidly fastened to the floor and walls. Set screws bearing upon the steel tubes near their ends permit adjust-

*Moving pictures were shown to illustrate equipment and procedure.

ment, and the tubes are placed accurately in a vertical position with the aid of plumb lines. This part of the x-ray tube mounting is stationary and once installed needs no further attention. The movable portion consists of two sleeves with locking clamps (taken from old style x-ray tube stands) fastened together by an aluminum casting which, in turn, is fastened rigidly to the cone of the x-ray tube. This together with the x-ray tube is counterbalanced by weights hanging within the supporting steel tubes. The x-ray tube is easily moved up or down without play or movement in any other direction and may be locked securely in any desired position. For the sake of appearance and protection of adjustments, an aluminum casting covers the movable portion as shown in Fig. 8. A steel tape together with an aperture and cross hair on the cover provides for precise setting of the vertical height of the x-ray tube.

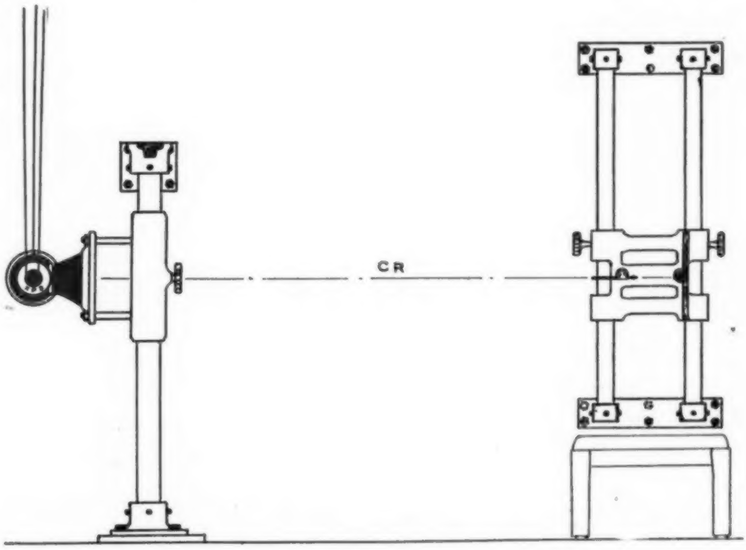

Fig. 9.—Diagram of lateral head x-ray equipment with covers removed. CR indicates path of central ray.

The mounting for the unit which carries the ear posts and cassette is shown at the right in Figs. 8 and 9 (Number 5 in Fig. 11). As for the x-ray tube mounting, the two heavy steel tubes are fastened rigidly to the wall by iron castings and set screws which permit accurate vertical alignment. These constitute the stationary portion, and all necessary adjustment is made at installation. The movable portion consists of a one piece aluminum casting provided with locking clamps. It slides easily up or down and may be locked securely in any desired position. This casting carries:

1. Two tool steel arms (shown at either side of the head in Fig. 8, in an end view in Fig. 9, and from above in Fig. 11). At their bases these arms are fitted into the aluminum casting, and each is held in place by eight set screws, permitting a fine adjustment. The ends of the arms (*A* and *B*, Fig. 10) are drilled to take the small steel tubes which carry the ear posts. Since shadows of these arms are recorded on the x-ray film, tool steel is used to permit small size; hence a minimum of obstruction, without sacrifice of strength and accuracy.

Sectional views of the ends of these arms with the ear posts and their supporting tubes are shown in Fig. 10. The arm *A* lies next to the right side of the head and carries the ear post which is inserted into the right external auditory meatus. The fiber ear post (2) is tapped to fit the threads of the steel tube (1). This tube is $\frac{3}{16}$ inch in diameter and 5 inches long. It slides through the hole in the end of the arm to allow adjustment for heads of different widths and is locked by set screws (3). The tube and ear post may be rotated

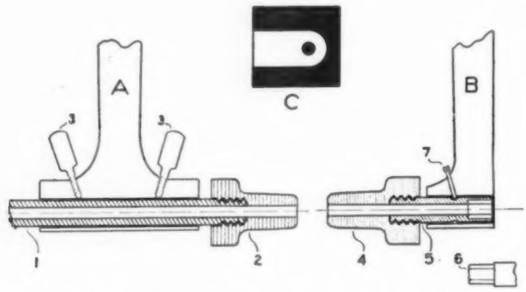

Fig. 10.—Sections showing construction details of the arms carrying the ear posts: *A*.—End of arm nearest x-ray tube; 1, steel tube; 2, fiber ear post; 3, set screws. *B*.—End of arm nearest cassette; 4, fiber ear post; 5, short steel tube; 6, end of key; 7, set screw. Section *C*.—Light area represents superimposed shadows of *A* and *B* on x-ray film with round black spot, the area exposed by rays passing through the lumens of 1 and 5.

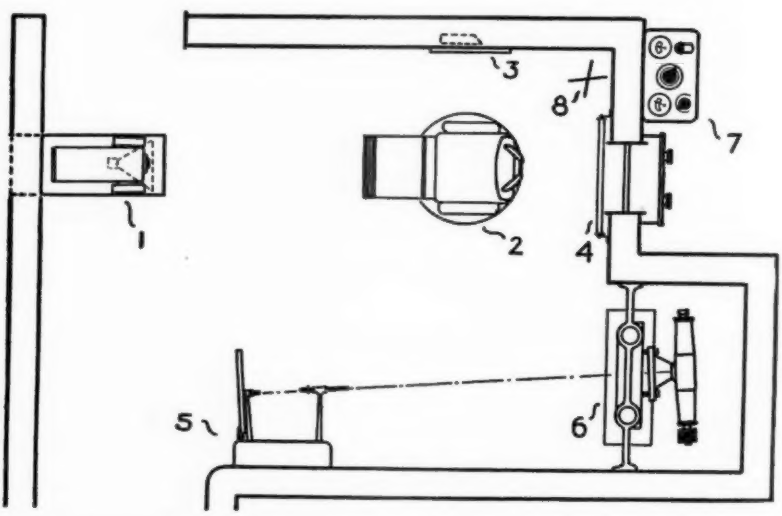

Fig. 11.—Arrangement of photographic and x-ray equipment: 1, camera, flood light and beam projectors; 2, dental chair; 3, mirror and lateral projector; 4, photographic background (white window shade on roller); 5, head immobilizer unit for lateral head x-ray pictures; 6, 30 Ma. x-ray tube and mounting; 7, x-ray control panels; 8, dental x-ray tube and flexible mounting (not shown) are fastened to the wall at X.

for ease of insertion into the auditory meatus. When adjusted and locked in place by the set screws the long axis of the tube and ear post is coincident with the central ray from the x-ray tube.

The left arm *B* lies next to the left side of the head and carries the ear post which is inserted into the left external auditory meatus. The fiber ear post (4) is here attached to a short tube (5) fitting into a hole in the end of the arm *B*. It is held loosely by the set screw (7) and does not slide through

the hole, but may be rotated freely to facilitate insertion of the ear post into the auditory meatus. For this purpose a key, having a hexagonal end (6) to fit a hexagonal enlargement in the tube (5) is used. After adjustment of the ear post the key is removed to allow close approximation of the surface of the cassette, which when swung into place lies against the surface of the arm.

The use of hollow steel tubing (1 and 5) to carry both right and left ear posts serves a special purpose. When these are correctly aligned the central ray (indicated by a center line) passes through both, giving a round black spot on the x-ray film similar to that shown in section *C*, Fig. 10. Since the slightest discrepancy in alignment of the two arms or in the setting of the x-ray tube will distort or eliminate this round spot, each film records a check upon the alignment of the equipment used.

Exposures are made at 30 milliamperes, at an average of 65 KVP and 2½ seconds, a target-film distance of 78 inches and slow (Patterson detail) intensifying screens. The size of the film is 10 × 12 inches.

All photographic and x-ray procedures are carried out in a room designed for the purpose (Fig. 11). A room of this kind occupies little space (6 × 10 feet) and adds greatly to the convenience and efficiency with which photographs and x-ray pictures may be made.

CONCLUSION

It is intended that this paper shall suggest (1) that we consider our patients as individuals; (2) that we attempt to recognize their differences; (3) that, however we interpret these differences for the moment, we set out to learn more about them; and (4) that we start to do this, simply, by adapting our routine orthodontic procedures to that purpose.

Research in many branches of the medical sciences has produced much information of value and of interest to us as orthodontists. Bone which forms the supporting structure of the teeth was once just bone to us, but research tells us that it is not the same in all individuals, and suggests that this variation may have an important bearing upon the success or failure of orthodontic treatment. Hands, wrists, and the long bones we once considered the exclusive province of the medical man, but research has suggested that they have significance to the orthodontist as indicators of progress in growth. We formerly studied the faces and jaws of our patients as isolated parts, piecing them together as best we could and attempting to estimate changes—research has suggested a means of visualizing these parts in their relations to each other, and of measuring changes with a greater degree of accuracy than we have known before. We can expect research to investigate problems of fundamental interest to us and to suggest the importance of its results, but I think that we should not expect research to get for us the detailed information necessary for the final application to our specific problems. That, logically, should be the task of the man who lives with those problems daily and has a first hand knowledge of their nature—the orthodontist himself.

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Republic Building

AGRANULOCYTOSIS INDUCING A SERIOUS MALOCCLUSION, WITH TREATMENT EMPLOYED*

PART I. ETIOLOGY AND TREATMENT OF PATHOLOGIC MANIFESTATIONS
BY L. D. CORIELL, D.D.S., F.A.C.D., BALTIMORE, MD.

PART II. ORTHODONTIC TREATMENT OF RESULTING MALOCCLUSION
BY H. E. KELSEY, D.D.S., F.A.C.D., BALTIMORE, MD.

PART I

AGRANULOCYTOSIS or angina agranulocytica is, as we all know, a disturbance of leucopoietic function, the etiology of which, at the present time, is entirely unknown in the true type of this disease.

The first American report, according to Hamburger,[1] was made by Lovett.[2]

There have been a number of cases reported as agranulocytosis, which in fact are leucopenias caused by definite etiologic factors; i.e., benzol poisonings, radiations, certain types of aplastic anemias, and some of the infectious diseases in which there is a drop in the leucocytic count and a decrease of granular cells.

In the true type of angina agranulocytica there is a febrile disturbance, sore throat, swollen, bleeding and ulcerated gums together with a drop in the leucocytic count, decrease and complete disappearance of the polymorphonuclears.

Of a record given in fifteen cases, all had sore throats and presented mouth and throat lesions. The average leucocytic count was 900, polymorphonuclears 9 per cent, with an entire disappearance of these cells in some cases, and a maximum count of 28 per cent.

The present theory is that it is due to a depressed function of the hemopoietic system and a lack of defense against infection by polymorphonuclear cells. The cause of this defect in function is not known.

With this brief description of the disease, I shall try to present for consideration a case in which I was called, that to me was the most interesting, and at times the most baffling, of any that I have had, and I am sorry (because of their exacting treatment requirements and high mortality) that I have had a number of this type, though fortunately with a fairly high percentage of recoveries.

The patient, a man 30 years of age, was taken to a local hospital on September 12, 1927, with a very bad case of Vincent's infection in the mouth and throat. The case was finally diagnosed as angina agranulocytica. He remained

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in the hospital until the following March, when I was called to see him. The following are abstracts from the hospital history:

Illness began September 12, 1927.

Temperature 102°. Red throat.

Impression: Grippe.

Laboratory test.—White blood cells 5650, with 68 per cent polymorphonuclear cells. The next day ulceration of the left buccal membrane was noted with soggy red gums. Received local treatment and improved. Vincent's and fusiform bacilli were demonstrated. Temperature normal in about five days.

September 23.—Temperature rose to 102°, and despite heavy local treatment his mouth did not improve. The general condition became worse.

September 30.—Blood had dropped to white blood cells 3100, polymorphonuclears 1 per cent.

October 1.—Patient was admitted to the hospital. Gums, pillars and fossae covered with grayish material. On the hard palate an oval-shaped area of grayish material. Smears were definite of Vincent's and fusiform bacilli. White blood cells 1600, polymorphonuclears none.

October 22.—Three successive smears were negative for Vincent's and fusiform bacilli. White blood cells 7200, polymorphonuclears 74 per cent.

November 15.—First relapse.

Positive culture from the maxillary left first molar socket. White blood cells 5050, polymorphonuclears 21 per cent.

During the next days, temperature rose to 102° and 103° daily.

November 23.—The polymorphonuclears were down to 1 per cent.

The glands on the left side of the neck were swollen, making eating very difficult. There was new ulceration on the left buccal membrane.

December, 1927.—The condition of the mouth was little changed. The polymorphonuclears were never above 5 per cent, with many counts showing none.

January, 1928.—The polymorphonuclears varied between none and 2 per cent.

February, 1928.—From January 22 to February 15, counts made every second day showed no polymorphonuclears and total granulocytes never over 32 per cent. Left hospital February 28, 1928, against his physician's wishes.

After the patient had been at home a few days, I was called in to see him. He seemed to be a man of average height, weighing at the time only ninety pounds, semidelirious, with a temperature around 102° or 103°.

Leucocytic count and granular cells low, no polymorphonuclears. On the upper left side of his mouth there was a lesion in the bicuspid area both buccal and palatine. The microscopic examination which I made showed a tremendous number of Vincent's organisms and fusiform bacilli.

I immediately started local treatments with oxidizing agents, instructing the nurse to apply at regular intervals through the day, and spray his mouth with a potassium chlorate solution every waking hour. I insist upon having a compressed air unit installed for efficient spraying in all cases of this type.

After a few days there was a drop in the patient's temperature with no increase in leucocytes. The local lesion increased in size together with the formation of a large granular mass back of the maxillary incisors; this we had to cut away with a high frequency coagulating current in order that the patient might close his teeth.

In the meantime, I had to change the local treatment three times, for after using one type of oxidizing agent for a time it seemed to lose its effectiveness.

With the formation of this granular mass back of the incisors, the area from the bicuspids to the lateral incisors began to drop inward and upward, finally with the complete displacement of the cuspid distally and toward the median line. I should like to add here that, prior to this, the patient had a normal occlusion.

At this stage I had an extract of leucocytes made at the School of Hygiene, Johns Hopkins University. This was injected intramuscularly (the patient first having been tested for sensitivity) with the result that, after three injections, the entire granular mass was sloughed off, taking a sequestrum of bone and leaving a perforated hard palate back of the incisor region about 20 mm. in diameter and a perforation of approximately 7 or 8 mm. on the right side opposite the first molar.

The leucocytic count began to rise with a proportionate amount of polymorphonuclears, and on August 23 the patient had entirely recovered.

The patient shortly afterward, unknown to me, consulted an exodontist in another city, who advised the extraction of all six anterior teeth. When he spoke to me about this, I strongly opposed it, not from a functional and esthetic standpoint, but with a possibility of a recurrence of the blood dyscrasia, and if so, with probable fatal result. He then asked me about closing the perforation by plastic surgery; notwithstanding the fact that his brother-in-law was a surgeon and advocated the operation, I opposed this also. I compromised, however, and agreed to go with him and have a consultation with one of our leading plastic surgeons. I am glad to say that he agreed with me and refused to operate.

The smaller of the two perforations, the one on the right side opposite the first molar, closed spontaneously. The perforation on the left and posterior to the incisor region remained open, and was about the dimensions previously stated.

I regret to say that in 1936 the patient contracted a pneumococcus meningitis and died in a few days. Patients who have this type of blood dyscrasia do not seem to have the resistance that they had prior to the disease, and succumb more readily to infections, although they may have a normal blood histology.

I persuaded this patient to go to Dr. Kelsey for treatment, and Dr. Kelsey obtained a magnificent result. I am sure that from this point on he can interest you more with his orthodontic treatment than I have with this brief description of a case that to me was extremely interesting and the final result, gratifying. The patient remained in perfect health for a period of eight years.

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111 W. Monument Street

Part II

Dr. Coriell has given a condensed but, I believe, comprehensive outline of the history and treatment of the pathologic phases of this case.

I shall attempt to give a brief description of the orthodontic treatment, with illustrations, showing the case after recovery from its pathologic phases and at various stages in its further conduct until completion.

I first saw the patient in May, 1929, after he had regained a normal degree of health. He presented, at that time, a Class I malocclusion, characterized by a pronounced open-bite of all the teeth from the right central incisor around to the first molar on the left side and a collapse and flattening of the arch on that side due to the loss of osseous tissue involving the palatal region and the supporting alveolus of the maxillary left canine and the teeth adjacent to it on both sides. The canine had tipped inward toward the median line of the arch, as-

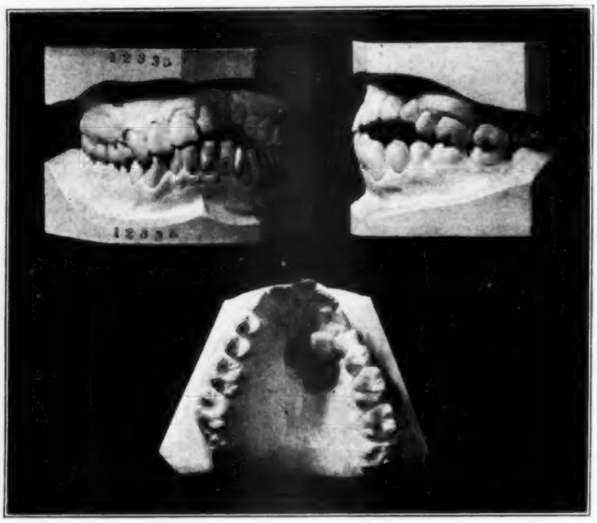

Fig. 1.—Front, left side, and palatal views of the case as it first presented.

suming a very oblique position entirely lingual to the arch, and the first bicuspid and lateral incisor were in approximal contact. The root of the left central incisor was denuded of both alveolar and gum tissue for perhaps two-thirds of its length. By careful and repeated cleansing, partial restoration of the soft tissues over the lingual portion of the root was secured. There was some doubt in my mind as to the vitality of this tooth, but as the patient experienced no discomfort, the opening up and filling of the root canal was delayed from time to time and had not been done at the time of his death seven years later, at which time I made the observation in a case note that the tooth appeared to be vital.

The perforation in the palate was about three-fourths of an inch long and a half inch wide and involved only a very small portion of the palate on the left side of median line. This, of course, seriously interfered with speech, and the patient at first stuffed the opening, which led directly into the nasal cavities, with cotton; this improved his speech very markedly. He then had a palatal

plate constructed, by a dentist, to cover most of the palatal surface of the arch and the crown of the left canine tooth. This greatly improved his speech but, owing to the open-bite, could not restore it to complete normalcy. Not having had experience with a similar case before, I could not promise complete restoration of the arch and replacement of the canine and other teeth in their normal positions; but I believed that if the patient's health remained good and there was no recurrence of the pathologic conditions, this might be done, and was well worth trying before resorting to the extraction of several teeth and the

Fig. 2.—X-ray picture showing the left side of the arch and most of the teeth involved in this truly acquired malocclusion. The contact between lateral incisor and first bicuspid, and the complete lingual exclusion of the canine from the arch, can be readily noted.

Fig. 3.—Palatal view of the case after about eight months' treatment. Note denuded root of left central incisor.

insertion of a prosthetic restoration. The orthodontic treatment was carried out along lines that I feel sure would have suggested themselves to any experienced orthodontist.

The greatest difficulty lay in the fact that it was important that the patient have a palatal plate to cover the perforation which would not at the same time engage the canine tooth. The plate he had was therefore discarded, and a new one constructed which passed around lingual to the crown of the canine but did not cover it. Maxillary and mandibular labial arches were inserted and bracket bands placed upon the left lateral and central incisors, and suitable force was applied to enlarge the arch and draw the canine labially toward its original position. By ligating the mandibular labial arch to a sufficient number of the mandibular teeth, a good anchorage for direct intermaxillary force to correct the

open-bite was secured, and the response to this treatment was immediate. Of course, as the canine tooth was moved away from the plate by means of band and ligatures, a space appeared between it and the plate which affected its efficiency. This was overcome by heating the plate in the cuspid region and applying a small amount of modeling compound and replacing the plate while

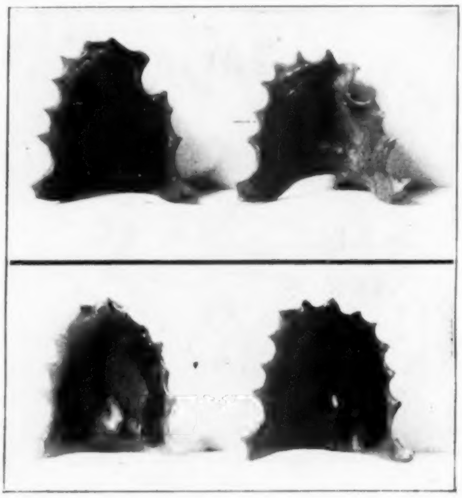

Fig. 4.—Series of plates which were constructed from time to time as the case progressed. One of them shows white compound attached to close the space between moving cuspid and plate.

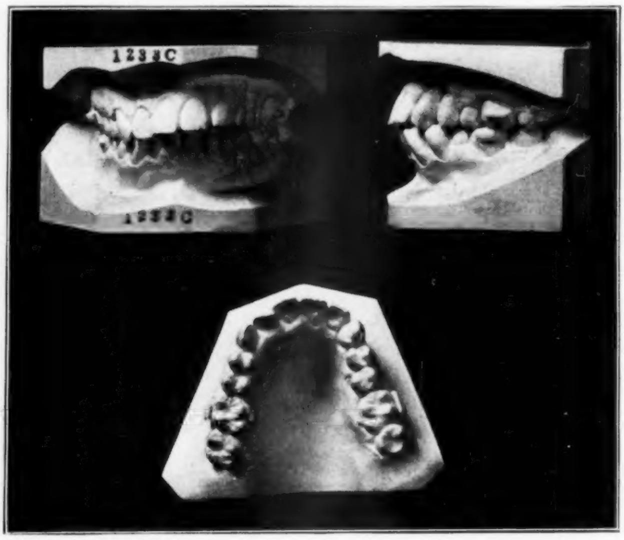

Fig. 5.—Case soon after active treatment was completed. The palatal view shows the very thin vulcanite plate which patient wore constantly.

the compound was soft. After it was thoroughly chilled, it served perfectly to close the opening and could be replaced several times as the canine and other teeth moved; but it was necessary, as considerable change took place, to make a new plate. This occurred every two or three months. In all there were about six or eight plates constructed. For no apparent reason, but probably as a result of some imperfection in the impression, one or two of the plates did

5 slides

not seem to be as airtight as others; the patient noticed this particularly when smoking. It was, of course, always necessary to pack the perforation in the palate with cotton when taking an impression. When active treatment was completed, all appliances were removed, and a final plate with as close adaptation to the necks of the teeth as possible, was constructed, which the patient used until his unfortunate death about two years later; and a duplicate of this was constructed by taking an impression of the plate in the mouth, pouring the impression, then removing the plate and replacing it with waxable vulcanite. To this last one, a clasp to a bicuspid on either side was added. After a year or so the patient's dentist thought a chrome alloy plate might be constructed which would be more compatible with the soft tissue, and I concurred in this, although there was no serious condition of the palatal gums. The patient's death, from meningitis, prevented this from being carried out.

It is noteworthy that this patient's apparent complete recovery from a severe blood dyscrasia of this type was further evidenced by the fact that the tissues involved responded to orthodontic stimulation in a perfectly normal manner. Between May, 1929, and June, 1934, this patient was seen one hundred and fifty-four times. After June 6, 1934, the patient was not seen until February 10, 1936, at which time I made the following note: "Case has been retained perfectly, there being no change since nearly two years ago, when patient was last seen. There is a little further recession of gum on the lingual surface of the right central root. The tooth appears still to be alive. The gums show the usual redness which is so often caused by vulcanite plates. The present vulcanite plate is very thin and comfortable and fits very snugly, but patient's dentist believes a chrome alloy plate would be more compatible with the gum tissue. I am inclined to think this myself; therefore I referred the patient back to his dentist to have the present plate duplicated or a new one constructed of chrome alloy. Patient is to return for observation after new plate is made." About two weeks later, and before this was done, the patient contracted meningitis resulting from an internal mastoid infection, and died within a week, a tragic circumstance which prevented my securing final models and other records of the case.

833 Park Avenue

DIAGNOSIS

Richard Lowy, D.D.S., Newark, N. J.

PROGRESS in any science necessarily must advance if it is a true science, but the rapid strides of progress of necessity cause controversies. The very thought of a new idea often causes many of the old standpatters to shudder and express the trite remark, "What is the new generation coming to?" They have become accustomed to doing their work in accordance with their early training and peculiarly refuse to open their minds to permit the penetration and assimilation of ever-changing scientific beliefs.

The following is a quotation from a paper read before this Society at its meeting held in Atlanta, Georgia, March, 1922. Dr. J. V. Mershon in his paper entitled "Physiology and Mechanics in Orthodontia" stated: "One of the most difficult things for an individual or a profession to overcome and change, even though it may be wrong, is precedent or an established custom or method of practice which has been in vogue for years, and more particularly is this true if the method or custom has been given prominence in the literature. No matter how great a fallacy it may be proved, years after it has been discarded by the masses you will find those who are still clinging to a practice of bygone days apparently opposed to any innovation or progressive step. Real progress is made slowly and at very irregular intervals."

This fact is borne out in the problems of appliance construction and diagnosis. There are men specializing in our profession who refuse to see the value of the Mershon lingual, or the Angle type labial, and even the Hawley retainer.

Since my subject deals with diagnosis, I shall discuss that phase in more detail.

Until the advent of Edward H. Angle in the field of orthodontics the question of diagnosis was still much of a mystery. Angle solved this dilemma when he established the law of the first molar, upon which he based his classification. It can be truly said of him that he elevated orthodontics from chaos to the realm of a science.

Until 1924, Angle's classification was based upon the theory of the constancy of the first molar. He maintained that, since the maxillary jaw was fixed, it would be less susceptible to malocclusion. His classification was dependent upon two points: the mesiobuccal cusp of the maxillary first molar and the buccal groove of the mandibular first molar. Therefore one can readily see that he took only the sagittal relation of the teeth into consideration, thus overlooking the fact that the deciduous denture was not always correct. Since

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the maxillary first molar erupts distal to the second deciduous molar, it may be forward from its so-called true position.

Dr. R. M. Strang is of the opinion that the word diagnosis is used far too broadly. He suggests the phrase "case analysis." The following is from his textbook of *Orthodontia,* page 310. "If a case is to mean anything it must be done in logical manner and the conclusions placed in written form on suitable records. This is important for several reasons. When one is called upon to make a definite decision that is to be recorded in writing, there is a tendency toward more careful and thorough study before the final conclusion is reached. It also makes possible a review of the case, when preliminary deductions are in evidence for comparison at the end of treatment. This is extremely valuable. It is frequently quite surprising to note the many problems that have presented themselves during the course of treatment that were completely overlooked in this preparatory study. Sometimes one wonders whether any real analyzing was done after all, the errors are so glaring. But if conscientious in this effort, the operator will find himself increasingly more careful and thorough in his preliminary case study."

The above quotation certainly seems to be a sound and logical means of case analysis. But let us examine further. Perhaps I should say backward: because on page 84 under "The analysis of cases showing faulty pairing of their inclined planes," Strang says "we must not jump to the conclusion that this is a Class II case for it may still be a Class I complicated by a mesial shift of the molars, premolars and canines of the maxillary arch. How can we differentiate between these two possibilities?

"1. Mesial axial perversion of the upper teeth, etc.

"2. A study of the profile will indicate whether the body of the mandible, as shown by the position of the chin, is in distal relationship to the anatomy of the skull, etc."

You may ask what is wrong with this line of analysis.

In the first instance in order to make a comparison one must have something to compare. If a line is drawn by itself, how can anyone determine whether it is vertical or horizontal unless its position in space is related to something in the same plane.

As for the use of plain photographs the angle at which the head is held can make an underdeveloped mandible worse in appearance or can make it appear almost prognathic.

Therefore though much can be said in favor of case analysis as practiced by Strang, it still is lacking and is dependent almost entirely upon the operator's diagnostic skill, and as such is most difficult to pass on to students.

An orthodontic diagnosis must be comprehensive and logical. Furthermore all deformities are not shown in plain plaster models. This method is wholly inadequate because it presents only the occlusal relationship of teeth. It does not take into consideration many other pertinent facts; i.e., lack of development and where, drifting of teeth, asymmetry of arches; degree of angulation of denture. This perhaps may account to some degree for many

of our failures in the treatment of Angle's Class II cases; i.e., the maxillary molars had drifted forward whereas the mandibular molars were in correct position.

The following is a direct quotation from Angle's textbook, *Malocclusion of the Teeth,* 7th edition. "The author is well aware of the criticisms to the acceptance of the first permanent molars as a basis for diagnosis for cases of malocclusion in contradistinction to the only heretofore known plan, which is entirely empirical and dependent upon the judgment of the operator, but he feels sure that an unbiased and more thorough study of the subject will demonstrate that the first permanent upper molar furnishes more nearly than any other tooth or point in the anatomy an exact scientific basis from which to reason on malocclusion." Thus you observe that orthodontic diagnosis was progressing from malposition of individual teeth to that of occlusal contacts and arch malrelations. Therefore Angle with presentation of his orthodontic classification entered the realm of fiction.

What is meant by the word fiction? It is not a scientific fact, and it cannot be verified but depends upon its usefulness; furthermore a fiction should not be discarded until another more useful fiction presents itself.

It is my firm conviction that the method of using plain study models is today inadequate in diagnosis because it utilizes only the sagittal relationship and does not take into consideration many other pertinent factors. We seldom see a case with just one malposed tooth; usually several teeth and their supporting alveolar process are involved in an anomaly. Perhaps the entire denture is in malrelation to the skull as a whole, or perhaps one section may be in correct relationship whereas another section is in malposition. Not all dentures are symmetrical; perhaps a condition of asymmetrical unilateral or bilateral anomalies is present. In fact, so many combinations of conditions may exist that the customary Angle classification does not adequately express the condition as presented.

In more concrete terms, an orthodontic diagnosis must be comprehensive and logical to be of value.

For a paper to be all inclusive in discussing the problem of diagnosis it would of necessity have to discuss so many phases that it would take many hours to read the article. Therefore only a few of the highlights will be briefly touched upon here.

Since we no longer consider the denture as an isolated part of the body, plain plaster models per se are of no great scientific value. Diagnosis as it should be practiced delves into many allied scientific fields; e.g., roentgenographic record of the cranium as advocated by Broadbent; the hand pictures of C. C. Howard; the study of facial growth as suggested by Milo Hellman, the use of Simon's technique, plus the common sense and experience of the operator.

All of us realize that no perfect plan has yet been presented for absolutely accurate diagnosis. In order that the orthodontist may be aided in his search for truth, however, he must see a normal denture, for every treatment strives to give a patient a similar one. But, by what quality can the norm of denture be recognized. Research has shown that the "normal does not

exist in nature for man's judgment but is created by him." In Simon's textbook we read, "the fundamental principle which reason can apply to the conception of the normal, and which it will permanently apply is usefulness;" and that "by its aid we are in many instances able to understand the real material world, to find our way and render practical treatment successfully" and that "the true character, or nature of the normal concept is best understood if we conceive it as fiction."

Paul Simon realized that our orthodontic problem was a biologic and not a mathematic one. He felt that the denture must be orientated to the skull. He desired to place the study of orthodontics on a broader and firmer basis, realizing full well that anthropology, biometrics, and heredity were necessary adjuncts to our everyday practice. He knew that ways and means must be studied and devised in order that practical applications of the aforementioned subjects may be attained.

The problem was, if the denture was to be considered as an anatomic and physiologic part of the head, an exact connection with the skull must be obtained.

With that in mind he was convinced that three objectives must be fulfilled:

1. Points must be easy to locate.
2. They must be relatively fixed.
3. Planes should be related to the denture.

With these three things in mind he promulgated his three-plane system, bearing in mind that it is impossible to map the planes on a patient absolutely and accurately. "These planes are not natural anatomic planes but artificial ones which can be represented by straight sections."

What were the planes used by Simon?

1. The Frankfort horizontal plane had been used by anthropologists; therefore Simon used it as a basis for his first plane; i.e., ear-eye plane. The two points are located. The orbitalia is the lowest point of the orbit directly below the center of the pupil of the eye; whereas the tragus is the highest point of the margin of the auditory meatus.
2. The median or raphe median plane is also easily obtained because the median raphe of the hard palate is used, and for all practical purposes divides the right and left sides of the denture. Furthermore this plane is vertical to the ear-eye plane.
3. The orbital plane is drawn at right angles to the ear-eye plane, starting at the orbitalia.

At this point I wish to quote Paul Simon: "Sometimes the criticism is made against the cephalometric method that the measuring point on the head can be determined only inexactly. This is partly true. If one has practiced one definite technique in making these points, the unavoidable inaccuracy is so small that it has no significance as regards the correctness of the diagnosis. But our critics who make this charge should not be so inconsistent, because they, at the same time, lay great stress on the 'constancy' and 'fixity' of position of the first permanent molars. It has been definitely proved that they

are not fixed, and so one must not say that they are in correct position; they are in an organ which perhaps goes through the most complicated development of all organs of the body and which is exposed to many external influences."

Since this paper is one relating to diagnosis, the technical details of gnathostatic impressions, models or photostats will not be discussed.

In order to make the definition of the difference between the existing case and the desired normal with more certainty than is possible by a mere examination of plain models Simon made of the so-called curve diagnosis. Certain of the features observed by the use of that method of diagnosis are:

1. Distance from median plane.
   a. Transverse symmetry.
   b. Arch form.
   c. Proportion of width.
   d. Axis of tooth inclination.
2. Distance from orbital plane.
   a. Sagittal symmetry.
   b. Degree of prognathism.
   c. Axis of tooth inclination.
3. Distance from eye-ear plane.
   a. Distance between it and occlusal plane.
   b. Angle between it and occlusal plane.
4. Photostat.
   a. Degree of prognathism or retraction.
   b. Face form and symmetry.

Before any explanation is presented on the means of observing any of the above mentioned, one criticism must be corrected—that of the time element. Since the desire of every orthodontist is to correct malocclusion, a thorough understanding of the condition must of necessity be the first prerequisite. One must plan and coordinate treatment, and therefore the time must be secondary. The time required to take the gnathostat and photostat really takes little more than that required to take an ordinary impression and photograph.

Now to return to the task of diagnosis.

Since the top of the base of the cast of the maxillary denture represents the eye-ear plane and the mandibular cast is articulated to it so that the base is parallel, certain important observations can be made. Furthermore the sides of the models are parallel to the median plane, and the backs of both casts are parallel to the orbital plane. This affords visualization of the existing deviation of height, width, and length. Combining the information obtainable from the models, graphs and photostat, and x-ray, we are ready to make a diagnosis.

1. Median plane.

   By measuring the distance from the median plane to the central sulci of the first premolars and first molars on both right and left sides, the

existing width of the denture is obtained. By comparison between them and Pont's index the norm is obtained. Due to the paralleling of the sides of the models, the inclination of the teeth is observed.

2. Orbital plane.
   The deviation here is dependent upon the position of the orbital plane in relation to the canines and prostheon. The inclination of tooth axis is also noted.
3. Eye-ear plane.
   The distance between it and the occlusal plane is noted.
   The angle as well as the occlusal curve is noted.
   The amount of overbite is also observed.

The use of the photostat is absolutely necessary to complete and verify the diagnosis. By the proper drawing of the line on the photograph many of the conditions already noted are more easily discernible; e.g., the maxillary protraction and the mandibular retraction, the asymmetry of the face form, the deep overbite.

This article has dealt rather superficially with the problem because of the time factor. There is one point, however, which must be stressed again. In order to evaluate properly any given condition one must start somewhere. Angle gave us the first starting point, which was a great step forward. Simon now has given to the orthodontic world a new and more accurate starting point. Its usefulness has been proved in hundreds of cases. Furthermore it should be accepted, and discarded only when a more useful fiction or proof presents itself.

Orthodontists with closed minds feel that gnathostatic diagnosis is gnathostatic therapy. This is a popular misconception. It makes no attempt to tell how to treat, nor does it advocate any given type of appliance. Its only function is to permit visualization as to what is wrong and where.

In closing I wish again to quote from Simon: "Hence, we define an orthodontic diagnosis as a search for, or determination of, the difference between the existing denture of a patient and the condition to be established. The former constitutes the anomaly, the latter the norm.

"However, it must not remain to our credit that this definition of the concept is applicable only to an orthodontic diagnosis; even though it is inapplicable in this form to medical diagnosis. The reason for this is due to the difference between 'anomaly' and 'disease.' Generally speaking, the physician deals with disease, or with individuals suffering from diseases, and it is to these that he applies his diagnostic efforts."

BAND FORMING PLIERS

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THERE are many seamless and even partially formed molar bands available on the market today. If one carried in stock a sufficiently wide selection, it should be possible, theoretically, to select the correct size and form for each case. This procedure, however, is needlessly confusing. Molar abutment teeth vary gradually in their mesiodistal and buccolingual diameters.

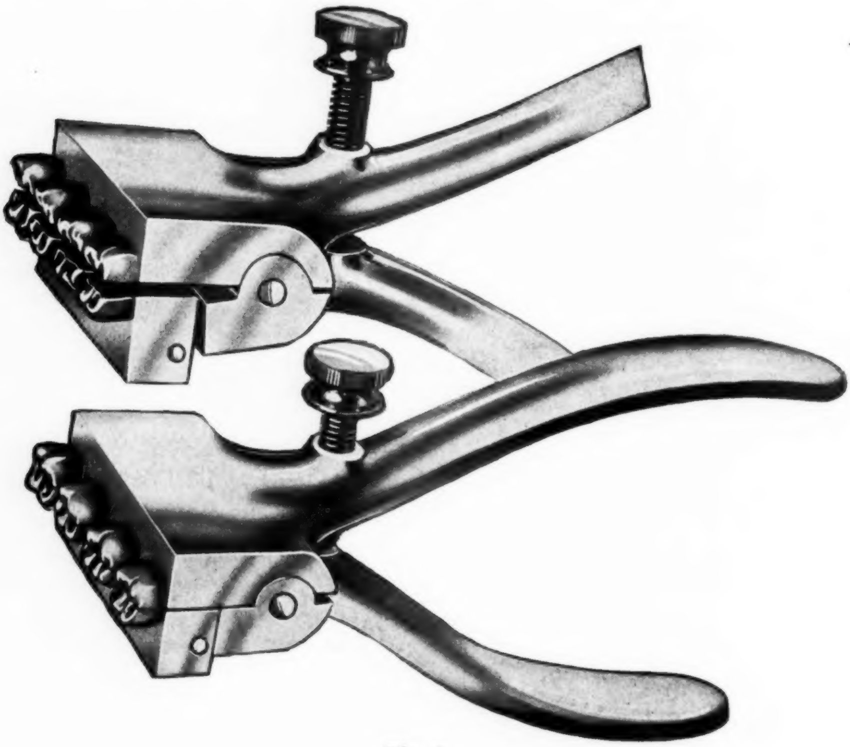

Fig. 1.

It is desirable, therefore, to have available a technique which will be flexible enough to suit all abutment teeth, with a minimum amount of manipulation. Fig. 1 shows a pair of pliers which I designed about two years ago to meet these flexible requirements. As the handles of the pliers are brought together by ordinary hand pressure, the beaks separate along the guide pins and in a direction which keeps them parallel to each other at all times.

From a small selection of seamless molar bands, ranging in circumference from 32 to 39 mm., a band is selected slightly too small for the tooth to be fitted. The band is carefully annealed, and then placed over the correct tooth on the pliers. There are four teeth mounted on these pliers—two idealized maxillary

first molars and two mandibular first molars. The handles are gently brought together, and the band is stretched. Where only a small increase in circumference is desired, this can be accomplished in one manipulation. Where it is necessary to stretch a band 2 or 3 mm., it should be done step by step, producing a slight stretch, releasing the plier, rotating the molar band, and stretching some more. The reason for this is that the metal of the band will be stretched equally at all points without producing any uneven and weak spots. The band may be tested in the mouth, until the desired circumference is obtained. When correct circumference is obtained, the band is set again on the pliers, and is burnished against the grooves of the steel tooth.

The four mounted teeth have been carefully selected from natural teeth of ideal proportions, and in most instances a band adapted as described here will require very little re-adaptation in the mouth.

MEDICAL TOWER

Department of Oral Surgery and Pathology

Edited by

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SURGICAL PROCEDURES IN EXODONTIA

SOME PREOPERATIVE AND POSTOPERATIVE MEASURES

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EXODONTIA is a well-defined and separate specialty. The surgical intervention of teeth, probably the oldest of dental operations, was practiced in the early days of history without regard for asepsis. In this era, we concede that the extraction of teeth, no matter how simple or complicated, is a serious problem, and requires special training, skill and experience on the part of the operator. Surgical procedures require proper and adequate armamentarium and should be practiced with a definite technique, taking into consideration of course the physiological and anatomical structures involved. The operator should be prepared to cope with any emergencies or complications which may arise.

PREOPERATIVE PROCEDURE

Both proper preoperative treatment and due consideration of the patient before surgery is attempted, predispose a successful operation with uneventful recovery. Patients presenting themselves for surgical treatment are frequently very nervous and apprehensive; their perplexed mental condition requires a calm professional attitude on the part of the operator. The following should be noted:

1. A brief history should be taken on all surgical patients.
2. Particular attention is given to mannerisms, speech, general physical appearance, size and color.
3. Note any physical defects that are present.
4. Nature of the complaint.
5. Why they have presented themselves for examination or operation.
6. If examined by a physician, what were his findings.
7. If they had a blood examination, what was the result.

On clinical examination record the following:

1. Oral symptoms, such as swelling, pain, soreness, location and duration.

2. Condition of mouth, teeth, saliva, mucous membranes, and throat.
3. Transillumination, roentgenograms, and vitality test.
4. Particular attention should be paid to those patients who work with volatile gases, such as gasoline and turpentine, as they need heavy premedication.

For the apprehensive and nervous patient it is advisable to prescribe pentobarbital sodium $1\frac{1}{2}$ grain capsules; one capsule to be taken the evening before operation and another capsule one-half hour before operation. This will insure a calm and cooperative patient. Those patients who cannot swallow a capsule or tablet may dissolve them in milk and drink the drug. Or one ounce of elixir of phenobarbital may be prescribed to be taken as follows: one teaspoonful instead of each dose of the capsule of pentobarbital sodium. Always inform patients to have some one accompany them to the office and advise against their driving a car, as this drug may cause drowsiness.

For bleeders, premedication is prescribed in the form of calcium lactate tablets of 5 grains each, two tablets three times a day; or calcium gluconate of 20 grains, twice a day for four or five days prior to operation. Jello in a liquid state should also be taken by the patient; one to two packages daily four days prior to operation will suffice.

The mouth should be cleansed of all food debris and deposits before any surgical procedure, especially in the region of the third molars, as these areas are likely to harbor Vincent's organisms. The gingivae and the third molar flaps should be cleansed with hydrogen peroxide U.S.P., or any of the drugs liberating nascent oxygen, such as sodium perborate. This is a good preoperative precaution as instrumentation in these areas, such as beaks of forceps and elevators, might drive hidden Vincent's organisms into deeper tissues. The tissues of the mouth should be treated preoperatively with a good antiseptic mouth wash. The area to be operated on should be dried with cotton or gauze sponges and painted with tincture of metaphen solution 1:1000, and then with a $3\frac{1}{2}$ per cent iodine solution. The tissues should be held tense, so as to facilitate needle puncturing with the least amount of pain, and the novocain solution injected very slowly. This will avoid collapse, heart embarrassment, and quivering of the extremities, as occasionally is seen in patients. Needles should be of small gauge, preferably 25 gauge stainless steel.

Patients suffering from thyroid conditions are very sensitive to epinephrin and have a severe reaction accompanied by a feeling of tightness across the chest. In these cases one-half teaspoonful of aromatic spirits of ammonia in a little water is a help, or the inhalation of aromatic ammonia in capsule form is a good remedy. Cold towels applied to head and face are also helpful. The patient should be placed in a horizontal position with head slightly lowered; or, if in a semirecumbent position, the head should be lowered below the patient's knees. This is a good, simple, and practical method of resuscitation.

Before operating on any patient it is best to use some lubricant in the form of vaseline, cold cream or camphophenique on the commissures of the mouth. This will prevent injury and abrasion of the tissues from stretching and retrac-

tion. Incisions should be well planned and should be made quickly and accurately avoiding tearing or bruising of tissues.

Preoperative treatment calls for the operator to keep instruments out of sight, preferably on an instrument tray behind the patient, or covered with a sterile towel. The patient's temperature should be taken before operating, especially in acute infection. When a bleeder is suspected, premedication should be carried out four to five days before operation, if possible, with drugs as previously mentioned. Roentgenograms are always advisable before and after surgical procedures.

POSTOPERATIVE PROCEDURE

This is a very important procedure in exodontia. Failure or success depends upon proper postoperative treatment and cooperation of the patient. After simple extractions, where no granulomas, cysts or osteomyelitis is present, a piece of sterile gauze is placed over the wound and the patient's mouth closed upon it with a little pressure for one hour. Instruct patient to remove gauze and replace a new piece of gauze over the wound for another hour.

Rinsing the mouth should be deferred until a good blood clot is formed, at least three or four hours after extraction. Ice bag or cold wet compresses extraorally for one-half hour on, and one-half hour off are very beneficial for five or six hours. This will minimize swelling, help coagulation, and relieve pain. An instruction slip with directions for postoperative home care should be given to each surgical patient. The following is routinely advised:

1. Rest.
2. Ice pack or cold compresses extraorally one-half hour on one-half hour off.
3. The taking of a laxative, such as citrate of magnesia.
4. One-half teaspoonful aromatic chlorazene powder dissolved in a glass of hot water every hour as mouth wash.
5. If needed for pain, the taking of tablets every two hours as prescribed.
6. Drink at least 1 pint of orange juice daily.
7. Light diet for first few days, such as milk, eggs, gruels, and soup.
8. If in severe pain, call the office.
9. If bleeding occurs, call the office immediately.

Postoperative hemorrhage, if anticipated, should be controlled before the patient leaves the office. Suturing and packing of the socket with plain gauze dipped in eugenol and tannic acid powder and placed in the socket, has been found very helpful. Allow this to remain for at least forty-eight hours before removing it.

If considerable postoperative pain is expected, as in deep infected wounds, nonvital teeth, impactions, and difficult extractions, it is best to dress the socket with iodoform gauze and place a few drops of eugenol and guaiacol of equal parts with an eye dropper on the gauze and insert it into the socket. Aspirin may be crushed and mixed with some form of surgical paste and inserted into

the socket. The patient is instructed to return daily and sometimes twice daily if the pain is severe for advice and a change of dressings until dismissed. In severe cases warm aromatic chlorazene solution is used as a mouth wash for three or four days, then patient uses hot saline and bicarbonate of soda ½ teaspoonful of each dissolved in a glass of hot water every two hours. This will prevent trismus, and minimize swelling and discomfort. Ice packs may be applied to the face in the usual manner as prescribed.

In cases of nonfluctuant, hard and indurated cellulitis, hot extraoral wet applications of magnesium sulfate are used. If the patient is sensitive to magnesium sulfate, use ammonium acetate (Burrow's solution) together with hot intraoral douches of normal saline solution every hour. This will reduce the swelling or prepare the swelling for incision and drainage, and then continue the hot wet compresses extraorally until complete recovery of the patient. Cathartics or enemas, and forced fluids are very effective.

In cases of fractures and osteomyelitis, the treatment is long and drawn out, and the patient is with us from two to six months. Postoperative care consists of daily irrigations every two hours with chlorazene solution or boric acid solution and a change of dressings. Twenty per cent argyrol solution placed into the osteomyelitis area is very helpful in the early stages.

The following procedures should be effected:

1. Periodic roentgenograms should be taken.
2. A high calcium diet should be advised.
3. Plenty of fresh air and sunshine is advocated.
4. Ultraviolet and infrared ray treatments are beneficial.
5. Occupational therapy is also very helpful.

Complete cooperation between physician and dentist should be sought in all surgical cases.

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TRAUMATIC INJURY OF THE CONDYLOID PROCESS OF THE MANDIBLE*

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TRAUMATIC injury of the condyloid process is not easily diagnosed, and is often difficult to treat. It may occur in conjunction with a more obvious fracture of the body of the mandible, when it is frequently overlooked. Fortunately, fractures of the condyle often heal without special attention, particularly when prompt treatment by means of intermaxillary ligation and fixation of the jaw is given. There are exceptions, however. Untreated fractures complicated by dislocation may have permanent limitation of motion, and resultant discomfort during mastication. In edentulous jaws considerable shortening of the ramus and asymmetry of the face due to overriding of the fragments are liable to occur if correctly constructed splints are not used. In compound injury with fracture of the articular fossa, or in the presence of infection, ankylosis may result.

Traumatic injury to the condyloid process may be classified as follows:

I. Subluxation (unilateral or bilateral).
II. Dislocation without fracture (unilateral or bilateral).
  a. Forward.
  b. Backward.
  c. Upward.
III. Collum fracture (unilateral or bilateral).
  1. Overriding of fragments.
  2. Displacement of condyloid process.
    a. Forward.
    b. Medial.
    c. Lateral.
  3. Dislocation of the condyloid process.
    a. Medial.
    b. Lateral.
IV. Traumatic ankylosis (unilateral or bilateral).

SUBLUXATION

Subluxation is often the result of minor trauma, such as occurs when difficult tooth extractions are attempted, with application of undue force by means of forceps or exolevers instead of the resection of a sufficient amount of alveolar

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bone to facilitate the operation. Careless use of the mouth gag during general anesthesia is another cause, producing rupture of the joint ligaments or injury to the meniscus.

The patient complains of weakness of the joint, felt when yawning or when undergoing prolonged operations in the dental chair. In some cases the condyle catches every time the jaw is opened wide, receding with a jumping motion. This is frequently due to the rupture of the attachment of the external pterygoid muscle to the meniscus, which causes the latter to remain in place during the forward movement of the mandible instead of being pulled forward. The condyle therefore slides off its anterior margin, producing a sound when it strikes the articular eminence; this sound often becomes extremely annoying to the patient, as it occurs principally while eating and is audible to others. Subluxation may be unilateral but is generally bilateral.

The motion of the jaw should be limited by a dental appliance, or motion should be entirely prevented by means of intermaxillary ligation, so as to allow the ligaments to regain normalcy. This may require from three to six weeks. Intermaxillary fixation is to be preferred to the use of a four-tail bandage—first, because it is invisible and, second, because the patient is unable to remove it. Liquid diet should be prescribed.

DISLOCATION WITHOUT FRACTURE

The mandibular joint possesses motion not possible in any other joint; therefore trauma will not always markedly increase its limitations, and dislocation may occur frequently without the joint capsule's being ruptured and without the condyle's piercing it. Dislocation is frequently associated with fracture at the neck of the condyle or the ramus, and indeed many dislocations can occur only in conjunction with fracture. These will be discussed later. Dislocation of the mandible without fracture occurs bilaterally more often than unilaterally.

Forward Dislocation.—Though comparatively rare, this type of dislocation is more frequent than others. It occurs occasionally in newborn infants during delivery, especially in head presentations, but is seen more often in adults. It may be caused by a blow on the chin when the mouth is open, by opening the jaws too far when yawning or by the injudicious use of a gag under general anesthesia. When dislocated the condyle rests anterior to the articular eminence, where it is locked by tension of the temporal, internal pterygoid and masseter muscles. The stylomandibular ligament, which is relaxed in ordinary forward motion, also becomes taut. The jaw remains in this position, as the combined effort of the muscles can no longer pull the head of the condyle back.

In acute forward dislocation the jaw is locked in a position that causes a so-called open-bite. The chin is moved forward and down. Eating and talking are difficult, and there may be salivation and dribbling. In chronic dislocation the jaw slips back into its normal position more easily because the capsular and sphenostylomaxillary ligaments have been stretched. The patient, however, is well aware of the condition and fearful of repeated experiences, which are brought about from the slightest cause because of weakness in the articular attachments. Yawning or opening the mouth wide, as during dental operations, may bring on dislocation.

The symptoms, together with the prominence of the condyles, which can be easily palpated when the jaw is dislocated, aid in diagnosis. The latter may be verified by means of x-ray examination (Fig. 1).

In acute dislocation, reduction by means of any force that makes the muscles and ligaments yield is inadvisable. It would cause further injury of the tissues, analogous to that which is often the cause of chronic dislocation. Instead, careful manipulation should be resorted to, reversing the process of dislocation. This is accomplished by opening the jaw wide, depressing the chin, and forcing the lower end of the ramus upward and backward. The head is thus made to glide over the eminence and back into the articular fossa; the jaws can then be closed. The use of general anesthesia facilitates the operation through relaxation of the muscles.

In order to prevent recurrence in acute dislocation, the motion of the mandible should be limited for a few weeks by applying bands to the teeth, to

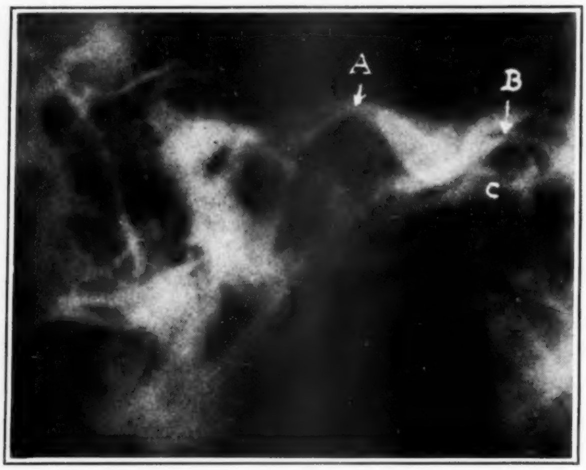

Fig. 1.—Case 1. Forward dislocation of the mandible. The condyle is locked anteriorly to the articular eminence. *A*, fossa articularis; *B*, position of condyle; *C*, anterior to articular eminence.

which are attached intermaxillary elastics or a silk cord to limit the opening to 1 cm.

In chronic dislocation the prognosis is rather poor. If not of too long standing, rest as described for subluxation may be of help. When dislocation occurs frequently and is accompanied by complete locking, permanent appliances as described for the acute type may be constructed.

Case 1.—The patient, a 42-year-old female, complained of protrusion of the jaw. The earlier history was irrelevant. The present complaint had started six weeks previously, when she had had her remaining maxillary and mandibular teeth extracted. The mandible protruded and could not be moved as before. There had been no accidents or injury.

Clinical examination revealed prominent condyles on both sides of the face. The motion of the jaw was limited. Roentgen examination of the mandibular joint showed the condyle anterior to the eminentia articularis on both sides. The diagnosis was forward dislocation of the mandible (Fig. 1).

Under ether anesthesia the condyles were manipulated to take their place in the mandibular fossae, when the true relation of the mandible to the maxilla was taken by placing wax plates previously prepared by the patient's dentist in the mouth and forcing the jaws into place. A temporary splint was improvised and held in place by a Barton bandage. Later the permanent splint constructed from the wax models was inserted and the jaw was held in place by a four-tail bandage for six weeks. The result was satisfactory, and the patient had maxillary and mandibular dentures made and could wear them without trouble.

Backward Dislocation.—A blow directed backward against the chin may cause detachment at the posterior margin and forward displacement of the meniscus. The head of the condyle moves backward and upward, coming in contact with the glenoid fossa. This type of dislocation is fortunately of rare occurrence. I have seen it in the case of an automobile accident, the blow striking the chin without causing fracture of the body of the mandible. Hemorrhage which accumulates in the posterior part of the joint prevents the disk from returning to its normal position. In more serious trauma the bone may be crushed into the auditory canal; this may terminate in ankylosis (see below).

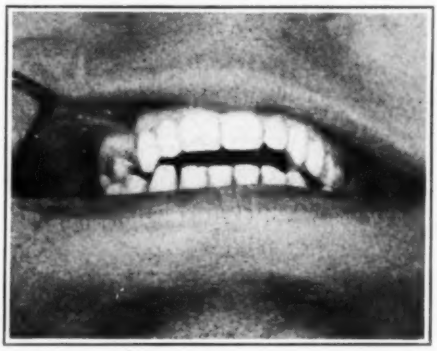

Fig. 2.—Case 2. Backward dislocation. The condyle, being pushed back and up against the glenoid fossa, causes an open-bite.

Such patients have the third molars in distal occlusion with open incisal bite (Fig. 2). Motion of the jaw is interrupted when opening on account of interference from the displaced meniscus. In the case of fracture of the tympanic plate, bleeding from the ear is generally noticed, and examination of the auditory canal may show obstruction.

Under ether anesthesia, with muscles well relaxed, the mandible is manipulated. Force is applied that tends to draw the condyle out of the articular fossa; this in turn may allow the meniscus to slide back into place. In order to keep the condyle out of the joint fossa until the tissue has recovered, the occlusal surface of the teeth should be raised in the mandible by inserting a rubber-plate wedge made to fit over the posterior teeth. The jaw should not be immobilized, however, as motion is desirable to prevent fibrous ankylosis.

Case 2.—The patient, a 30-year-old male, complained of inability to eat because he could not get his teeth to occlude, except the molars, and was unable to open his jaws wide on account of interference. He said that the surgeon who had treated him had asserted that under ether his jaw could be closed normally. The earlier history was irrelevant. The illness started after an automobile accident, when the maxilla was fractured on the right

side; the fracture included the malar bone. The patient had since received treatment, and although the fracture had healed, his symptoms had not improved.

The clinical examination showed that the fractured part of the maxilla had united too far lingually so that the teeth could not occlude normally. Furthermore, the incisors and premolars could not be brought into contact, as the last molar teeth on both sides came together and prevented closing of the bite (Fig. 2). As this condition was the same on the left, where no fracture had occurred, it could not be attributed to the above-mentioned malunion. Sometimes the patient could open his jaw wide, but at other times something interfered and he could open it but little. X-ray examination was advised, and a provisional diagnosis of backward dislocation of the mandible with displacement of the interarticular cartilage was made.

The x-ray report was essentially negative. There was no evidence of fracture or malunited fracture in the region of the ramus or at the neck of the condyle.

With avertin and nitrous-oxide-oxygen anesthesia, osteotomy was performed on the right maxilla, and a previously constructed splint (Fig. 3) was applied so as to assure healing in a normal position. The defective occlusion of the mandible was not improved thereby. The anesthesia was supplemented with ether to obtain complete muscular relaxation so that

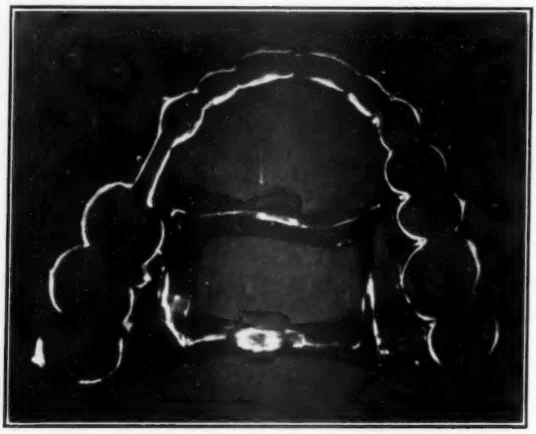

Fig. 3.—Case 2. Splint used to hold refractured maxilla in position.

the jaw could be manipulated. It was found that by forcing down the ramus the mandible could be occluded normally. After a few attempts the jaw remained in normal position when closed, presumably because the meniscus had moved back into its normal place. Intermaxillary ligation was then used; by wiring the teeth to the splint in the maxilla it was hoped that the incisors could not be forced back into the opened position.

A Barton bandage was applied to prevent pulling down of the side where the maxilla was fractured. After five weeks the wires were removed, when it was found that the patient had no difficulty in closing his teeth normally, and that the opening motion was no longer interfered with.

Upward Dislocation.—This is extremely rare and may occur in conjunction with backward dislocation, or as a more serious condition when the condyle is forced through the glenoid fossa into the middle cerebral fossa. This is liable to happen where there are no posterior teeth to take up the force when a blow is directed to the anterior part of the mandible.

Reduction under general anesthesia should be followed by the application of a denture splint replacing the missing back teeth, the bite being opened at the same time. External drainage may be indicated. The splint should im-

mobilize the jaw for four or five weeks. If ankylosis results, exercises with the purpose of forcefully opening the jaws are indicated. In extreme cases arthroplasty must finally be resorted to.

COLLUM FRACTURE OF CONDYLOID PROCESS

This is a common fracture, and probably occurs more frequently than statistics indicate, for in multiple fracture it is often overlooked. It is generally found at the lower part of the neck of the condyle (Fig. 4); it frequently involves part of the ramus, extending in an oblique direction downward to the posterior border of the bone (Fig. 5).

The fracture is caused by a blow on the chin, and is usually bilateral. It is often associated with fracture in the region of the symphysis. Unilateral fracture of the condyle may be associated with fracture of the mandible on the other side in the premolar or molar region. It may occur, however, as a single fracture when the blow is directed to the side of the face, for instance, in the region of the middle of the ramus. I have seen bilateral fractures caused by the following accidents: a girl of nine falling from a bicycle and striking her chin on the sidewalk, a rider falling when taking a hurdle, a flier landing his airplane, an amateur tree-chopper getting hit on the chin by the falling trunk, and several patients injured in automobile accidents. I have seen unilateral fractures in a boy who fell while roller skating, in a patient who received a lateral blow to the angle of the jaw, and in victims of automobile accidents. In one patient the collum fracture from a lateral blow was associated with fracture of the maxilla.

Collum Fracture With Overriding of Fragments

The overriding of the fragments is caused by muscular contraction. This is due to trismus resulting from collateral edema associated with the trauma. If most of the posterior teeth are present, the condition is recognized by open-bite in the incisor region. In jaws edentulous in the posterior part, it may be overlooked until after the swelling of the face has subsided, when we discover facial asymmetry, the angle of the jaw being higher and the chin being moved toward the affected side. In cases where the jaw has united in such a position the patient complains of painful sensation in the joint and ear; this is due to pressure or friction caused by the condyle when moved in its abnormal relation.

Diagnosis is made by means of x-ray examinations of the joint from a lateral point of view and from an anteroposterior aspect. One or the other, or both, will show the deformity.

Treatment should be instituted as soon as possible after the accident. The fracture is reduced by means of manipulation under ether, followed by intermaxillary ligation if a full complement of teeth is present. In case of partially edentulous jaws a denture splint must be constructed before the reduction is attempted. This is inserted after satisfactory results have been obtained by manipulation, for the purpose of holding the jaws in proper relation while healing is taking place.

In malunion of long standing, discomfort in the joint may subside in time. If dentures are worn, these may have to be adjusted to the new maxillary rela-

tions, and this may also help to improve the condition. If pains are persistent, however, and radical surgical treatment is necessary, an osteotomy at the neck of the condyle may have to be performed, which when followed by fixation of the jaw in normal position will bring back normal relations. In complicated cases, osteoarthrotomy or arthroplasty may have to be resorted to.

CASE 3.—The patient, a 28-year-old female, complained of pain when moving the jaw, with pain in the ear and swelling of the face. The earlier history was irrelevant. The condition was caused by an automobile accident two days before.

On clinical examination the posterior maxillary teeth on the left side were freely movable with a large section of the alveolar bone. There was crepitus on the left side when the jaw was opened, and pain upon pressure applied in front of the tragus of the ear. Provisional diagnoses of fracture of the alveolar process of the maxilla and collum fracture of the left mandible were made. Roentgen examination was advised.

Intraoral films showed a fracture of the maxilla involving a fragment containing premolar and molar teeth. The mandible showed horizontal fracture through the neck of the condyle, with overriding of fragments and shortening of the ramus (Fig. 4).

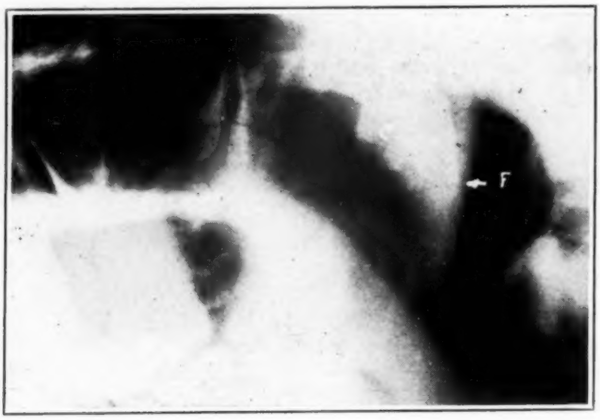

Fig. 4.—Case 3. Collum fracture with overriding of fragment and shortening of the ramus due to muscular trismus. *F*, fracture line.

Under ether anesthesia a splint was placed in the maxilla to hold the fractured parts in position. The ether anesthesia deepened and when the muscles of the jaw became relaxed the fracture of the condyle could be reduced by manipulation. Fixation was secured by intermaxillary ligation. Recovery was uneventful, and the splints and wires were removed after six weeks. Normal motility was obtained after ten days, during which the patient was advised to exercise the jaw systematically.

CASE 4.—This patient, a 24-year-old female, complained of a pain in the right mandibular joint and a crackling noise in the left one. She was unable to wear her dentures. She had been in an automobile accident six weeks previously, hitting the dashboard with the right side of the face (ramus). She had seen her family physician, who applied adhesive tape. Her teeth had all been extracted seven months before, and she had had full dentures made five months before. These she had worn with comfort until the accident.

Clinical examination showed asymmetry of the face, the chin being drawn to the right; the median line of the mandibular denture was transposed about 1 cm. to the right, and the teeth therefore did not occlude. Movement of the jaw was not interfered with, but a noise could be heard when the jaw was opened. There was no crepitus or other indication of ununited fracture.

The roentgen examination consisted of lateral and vertical exposures. The latter revealed a malunited fracture at the neck of the condyle of the mandible on the right. There was a

slight outward displacement of the condyle, and because of overriding the ramus was shortened. The outline of the mandible and its location were asymmetrical.

The patient was advised to have a new set of dentures constructed by her dentist. These proved successful. The pain in the joint was relieved, but the facial appearance was not greatly improved.

Collum Fracture With Displacement of Condyloid Process

Forward Displacement.—This is the commonest type of displacement, since the external pterygoid muscle is attached to the neck of the condyle at the pterygoid pit and in case of fracture draws the neck of the condyle forward. The condition is recognized in a lateral x-ray picture of the mandibular joint (Fig. 5).

Medial and Lateral Displacements.—Lateral displacement is more common. It is caused when the ramus is pressed upward on the inside of the condylar

Fig. 5.—Case 5. Collum fracture, bilateral, with fracture at symphysis of mandible; the x-ray picture shows a fracture of the condyle on the left and right with forward displacement of neck and overriding due to muscular contraction. *C*, condyle; *F*, fracture line.

fragment, locking it into position by contraction of the masseter and internal pterygoid muscles. Lateral x-ray pictures show the overriding; the anteroposterior view, on the other hand, shows the medial or lateral displacement of the condyle.

Reduction is accomplished by manipulation under avertin and ether anesthesia. The patient must be prepared for the operation so as to avoid postoperative vomiting. The jaws are immobilized for from five to six weeks by intermaxillary ligation or the use of splints. In cases of marked forward displacement, open reduction may be indicated. When the head of the condyle is moved into place, it can generally be fixed by wiring the teeth, which is done by an assistant, the wound being protected by a piece of wet gauze. If this is not successful a galvanized nail may be placed anterior to the condylar fragment to hold the latter in place. It is allowed to project through the wound and is removed after a week or ten days.

CASE 5.—The patient, a 24-year-old male, complained of a fracture of the mandible, with bleeding from the chin, pain, and inability to close the jaw. The previous history was irrelevant. The present illness started with an accident which occurred while the patient was cutting down a tree; the falling trunk struck him on the chin.

At the clinical examination there was pronounced swelling under the jaw and on the chin, where there was a contusion of the skin. There was a slight swelling of both cheeks. The mandible had been displaced, and there was crepitus in the anterior part and the region of the joints. The maxillary left central incisor was loose, as well as the mandibular right central incisor.

In the roentgen examination anteroposterior and lateral exposures were made. These showed a vertical fracture in the anterior portion of the mandible, close to the median line. Here an unerupted tooth was seen, which lay horizontally. The tooth did not seem fractured, but the fracture line extended beyond it. The lateral view showed fractures at the necks of the condyles on the right and left sides. Both condyles appeared to be displaced anteriorly, and there was overriding due to muscular contraction (Fig. 5). Dental films of the maxillary teeth showed luxation of the left central incisor.

Fig. 6.—Case 6. Collum fracture with lateral displacement. *C,* condyle.

With premedication, pentobarbital sodium (3 gr. nembutal), and gas-ether anesthesia, the retained tooth in the anterior part of the mandible was removed. The maxillary central incisor was extracted, as well as the mandibular central incisor, which was found involved in the fracture. The jaw was placed in what appeared to be normal position and fixed with intermaxillary ligation. Roentgen examination after operation showed that manipulation of the fragments had not produced good results at the condyle. The patient was operated on again two days later. An external incision was made in front of the ear and extended at right angles along the zygomatic process. The condyles were exposed and forced into normal position. The patient was dismissed eleven days after operation. Healing was uneventful. Fifty-one days after the second operation the patient had normal union and could move his jaw well; occlusion was satisfactory.

CASE 6.—The patient, a 37-year-old male, complained of pain when moving the jaw and a swelling on the right side of the head. The previous history was irrelevant. The patient fell while taking a hurdle on horseback, injuring his left arm and shoulder, right ankle, and face.

Clinical examination showed the region of the right condyle of the mandible to be tender on palpation; there were pain and crepitus when moving the jaw. A provisional diagnosis of fracture of the ramus was made.

Roentgen examination of the left arm and shoulder, thoracic cage, right leg and foot, and skull showed no evidence of fracture. The anteroposterior view of the head showed a fracture at the neck of the condyle, displaced laterally. There was considerable overriding, due to muscular contraction (Fig. 6).

The fracture was reduced with ether anesthesia and the position retained by intermaxillary ligation. After five weeks the wires were removed, and motion of the jaw was found to be normal except for slight muscular interference, which disappeared in a few days.

Collum Fracture With Dislocation of Condyloid Process

Luxation fracture is not very common in the mandible, probably because of the free movement which is allowed the condyle in the joint. It occurs as follows: the bone fractures but does not separate, and on account of continuance of the traumatic action the condyle is then pressed out of the capsule either medially or laterally. Compound dislocation is rare.

Medial Dislocation.—This is the common type of dislocation because of the action of the external pterygoid and the anatomic condition of the fossa articularis, which favors a medial dislocation rather than a lateral one. The meniscus generally remains in the fossa, while the condyle pierces the capsule. The cause may be a blow to the angle of the jaw, causing fracture at the neck without displacement, the continued force pressing the medially bent condyle out of the socket.

Lateral Dislocation.—This type is uncommon, as it is prevented by the very strong outer capsular ligament, and the protection afforded by the zygomatic arch. A case has been reported in which the ramus fractured at the angle and the condyle was dislocated in a lateral and upward direction. In such cases compound fracture may occur.

The diagnosis of medial and lateral dislocation is made by means of x-ray examination. The anteroposterior view best shows the dislocation (Fig. 7). The lateral view generally discloses the fracture line. There may be considerable swelling of the face. In Case 7 this was mistaken for mumps, and the patient received no treatment for two weeks.

Reduction is indicated even in cases of one or two weeks' standing, although the prognosis of an untreated dislocation is not bad, the condyle and ligaments having great power to adjust themselves to a new position, especially in children. If the fracture is incomplete, manipulation under general anesthesia may reduce the dislocation. As a rule, open reduction must be resorted to. The approach is through an incision along the lower border of the zygomatic arch, after which the condyle is located by blunt dissection. In lateral dislocation this presents no special difficulty; in median dislocation the external surface of the ramus should be exposed after detaching part of the masseter muscle. The condyle can then be located, taken hold of by means of an instrument with a half-round, pointed hook, and pulled back into position while the ramus is pressed down. The wound is then closed and the jaw fixed by means of intermaxillary ligation or a splint. In spite of fixation, the retention of the meniscus and of the synovial membrane, if intact, prevents anklosis. In case of destruction of

the joint, however, ankylosis may result, especially in children. In such cases an arthroplasty may have to be performed later. When using intermaxillary ligation for retention it is important that the patient have no posterior edentulous condition on the affected side, because undue pressure on the condyle may cause resorptive processes during the period of fixation.

After four weeks the ligatures are removed. Although the result may be good, the patient may not have normal function at once. Exercises must be prescribed to limber up the jaw and to increase motility.

CASE 7.—The patient, a 9-year-old boy, had a swelling of the parotid region, and consulted his dentist on account of pain from an injured tooth. The dentist referred the patient for examination. The earlier history was irrelevant. Two weeks previously the boy had

Fig. 7.—Case 7. Collum fracture with median dislocation. *C*, condyle; *F*, fracture.

fallen on the sidewalk and injured a front tooth. The next day a swelling appeared in front of the ear on the left side, and he was put to bed, as he was thought to have the mumps.

Clinical examination revealed a swelling in the zygomatic region; the patient could open his mouth only part way, and complained of pain when pressure was applied in the region of the condyle.

At roentgen examination the lateral view of the left side of the mandible showed an oblique fracture at the neck of the condyle without displacement. The anteroposterior view showed median dislocation of the head of the condyle (Fig. 7).

Avertin anesthesia supplemented by ether was used. An incision was made over the zygomatic arch, and the ramus was exposed. The condyle was located and pulled into place by means of a hook while the ramus was pressed down by an assistant. The condyle could then be seen functioning in the socket as the jaw was moved. The fascia was brought together and held by catgut sutures, and the incision was closed with horsehair sutures. The teeth were fixed in occlusion by intermaxillary ligation. When the wires were removed after twenty-three days, the jaw was stiff, but when the patient was seen five days later he had regained normal function.

TRAUMATIC ANKYLOSIS

Ankylosis of the jaw may follow traumatic injury, although it is more frequently caused by infectious arthritis, otitis media, and osteomyelitis of the ramus. Orlow,[1] who wrote one of the most comprehensive articles on mandibular ankylosis, found trauma as the cause in 28 cases out of 100. In 23 of these cases the trauma was due to accidents such as a fall on the chin, a blow, or a fracture of the body of the jaw or base of the skull. In a few cases there was a compound fracture due to gunshot injury, and in 2 cases forceps delivery was the cause. We therefore find ankylosis resulting from a variety of traumatic injuries; the immediate causes, however, are interarticular hemorrhage, comminution of the joint, and secondary infection. A case of fracture of the base of the skull complicated by otitis media and mastoiditis and followed by bony ankylosis and hyperostosis is reported below.

Ankylosis may be due to the formation of fibrous bands which firmly connect the condyle with the articular fossa. This condition frequently follows comminution of the interarticular meniscus or its destruction by secondary infection. It generally allows moderate hinge movement, but no forward and lateral motion. The patient is able to masticate moderately, particularly if he makes an effort to prevent complete ankylosis by means of exercises.

In other types of mandibular ankylosis there is bony union and therefore complete loss of function. This may be the end result of fibrous ankylosis, but may also occur directly, especially in trauma resulting in fracture or comminution of the bony part of the joint in the presence of infection. Extensive hyperostosis may result, with firm attachment to the base of the skull, or with union of the ramus to the zygomatic arch, often including the coronoid process.

The onset of ankylosis is not always promptly recognized because its development is gradual, and is often overshadowed by more noticeable symptoms such as swelling of the face, fractures of the body of the mandible or base of the skull and secondary infection of adjacent parts. Infants may have mandibular ankylosis, which during the period of nursing from the breast or the bottle may be overlooked, often until much later when solid food is ordered.

When ankylosis is complete there is generally little difficulty in establishing a diagnosis, as the patient's chief complaint is a long-standing history of inability to open the mouth. Fracture of the condyle of recent origin, which often prevents free motion, can easily enough be ruled out. Muscular trismus, however, sometimes produces complete locking of the jaw (pseudoankylosis), and when it becomes chronic, as in cases of actinomycosis and myositis ossificans, may be mistaken for ankylosis vera. The commoner acute type of trismus of the masseter and internal pterygoid muscles is more easily differentiated. It is, as a rule, of very recent development and is due to infection, particularly pericoronal infection around a partly erupted third molar. It is attended by pain, swelling at the angle of the jaw, painful deglutition, and a rise in temperature. The x-ray examination easily discloses the condition. For the purpose of differential diagnosis it should also be remembered that the head of the condyle may be the seat of osteoma or chondroma. Such a case has been described by Ivy.[2]

In fibrous ankylosis the patient generally has slight motion, while in bony ankylosis motion is completely lost. The condition may occur bilaterally, but more frequently only one joint is affected. In cases of long standing the second joint may remain normal and retain its ability to function properly after operation on the affected side. If it is normal, the patient can push down the ramus slightly so as to create a small space between the molars, even if the other side is completely fixed.

In cases of ankylosis acquired very early in life the mandible remains markedly underdeveloped owing to lack of mastication. The chin recedes and the teeth are often crowded, so much so that the first permanent molars have insufficient room in which to erupt.[4] The teeth also become carious and abscesses may form. Some patients are extremely undernourished; although it is remarkable how some of them, especially children, manage to push food into their mouths behind the last molars or through spaces created by the loss of deciduous teeth.

Ear deformities or the entire loss of the external ear is sometimes associated with childbirth trauma. I[3] have reported a case of this type elsewhere. When treating such cases it must be remembered that the muscles are either underdeveloped or atrophied if ankylosis occurs late in life. This accounts for the disappointing fact that after an arthroplasty has been performed the patient cannot open his jaw very wide. Daily exercises are indicated in such cases, and often a dilator must be used for a long period of time in order to accomplish the desired result.

Roentgen examination (Fig. 9) often gives valuable information, although the result may be disappointing on account of anatomic conditions. In cases where hyperostosis is excessive and where ankylosis with the base of the skull or zygoma is involved, good roentgen demonstration of the deformity is especially difficult. It is nearly always necessary to take exposures from various angles, and the anteroposterior as well as lateral positions are needed. Sometimes stereoscopic pictures are of value.

The treatment of ankylosis is surgical. Severing of the fibrous connections in the joint is seldom successful, partly on account of the great depth of the condyle, which makes access difficult, and partly because this severance would hardly give permanent relief. Osteotomy at the neck of the condyle with arthroplasty often prevents reattachment, but only temporarily. The most satisfactory result is gained from osteoarthrotomy.

In performing an osteoarthrotomy a horizontal incision made over the zygomatic process and extended at right angles in front of the ear down to the tragus gives the desired exposure. The condyloid process is sectioned first, generally at its attachment to the ramus, at about the height of the mandibular notch. The condyle is then excised. If there is considerable hyperostosis, the chisel must be used to separate the bone from the base of the skull or from the zygomatic arch. If the coronoid process is involved, the osteotomy must be performed in the upper part of the ramus, with separation and excision of both the condyloid and coronoid processes.

CASE 8.—The patient, a 6-year-old boy, was referred for examination because his head had ached several times during the previous week, and because he had had pains in the stomach and vomiting; he was unable to open his jaw and could not eat properly. The previous history was irrelevant. The boy had never been injured before or had previous trouble with his ears or jaw. The illness started eighteen months previously, when he was knocked unconscious by an automobile. He was treated at a hospital for fracture of the left femur, which

Fig. 8.—Case 8. Before operation the patient was not able to open his jaw.

Fig. 9.—Case 8. Ankylosis and bony hyperostosis of the mandibular joint. Osteotomy was performed between the white dots, and the bony mass was excised. *C*, enlarged condyle.

was somewhat comminuted; the leg was angulated and shortened. Soon after admission the patient developed an acute mastoiditis, which was operated on. A definite fracture of the skull, not visible in the x-ray picture, was discovered at operation. He was dismissed two months after the accident and was followed in the outpatient department, the last visit having been made ten months previously.

The physical examination showed a thin, poorly developed and poorly nourished child; the skin was pale. He was unable to open his jaw. The right side was absolutely fixed; on the left side the teeth could be opened about 1.5 mm. (Fig. 8.)

Roentgen examination showed a normal mandibular joint on the left, and bony ankylosis and hyperostosis of the condyle on the right (Fig. 9).

The diagnosis was bony ankylosis of the right mandibular joint. Osteoarthrotomy was advised.

Fig. 10.—Case 8. Two days after operation, rubber drain was removed.

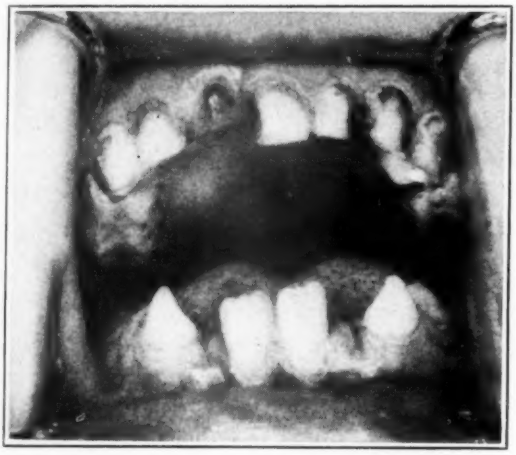

Fig. 11.—Case 8. After osteoarthrotomy the patient could open his jaw freely and masticate well.

With avertin and ether anesthesia an incision about 4 cm. long was made along the zygomatic arch, and was extended by vertical incision in front of the tragus. After dissection of the skin flap the fascia was divided and the posterior attachment of the masseter muscle to the zygomatic arch was severed. This brought into view the head of the condyle, which was found to be greatly enlarged and about the size of a pigeon's egg. When the capsule was opened, the articular surface was found solidly ankylosed to the glenoid fossa. The periosteum

was incised and the ramus was bared at the site of the attachment of the bony mass. Here an osteotomy was performed, the chisel being forced in an oblique direction from the middle of the mandibular notch down to the posterior border of the ramus (Fig. 9). The jaw could then be forcefully opened to about 2.5 cm. between the incisor teeth, after which it was freely movable. Next, the head of the condyle was excised, being separated from the base of the skull with a chisel. Its removal left a large space, which was partly filled with a piece of masseter muscle, turned over the cut-off part of the ramus and sutured to the internal pterygoid. A rubber drain was inserted to prevent hematoma. The fascia was sutured with catgut, and the skin with horsehair sutures (Fig. 10).

The immediate postoperative condition was good, and the next day when the patient was examined it was found that he could open the jaw wide and without pain (Fig. 11). There was no facial paralysis. There was considerable local swelling about the wound but no infection. The drain was removed on the second day. On the fourth day the patient developed a temperature of 103.5° F. without pain in the jaw or other symptoms, and on the sixth day the temperature was 104.5° F., when a diagnosis of acute follicular tonsillitis was made by a consultant. He received treatment, and the healing progressed uneventfully from then on. He was given chewing gum to exercise his muscles the first day after operation, and when dismissed was much improved physically, owing to the fact that he ate well and could masticate his food. At a re-examination two months later, it was reported that he was eating well and without any discomfort. He had very bad teeth because he had not been able to clean them or have them filled while his jaw was ankylosed, and was referred to a dental clinic for treatment.

SUMMARY

Traumatic injury of the condyloid process frequently results from minor trauma, such as occurs from application of undue force when extracting teeth, or from careless use of the mouth gag under general anesthesia. This often causes an injury involving the joint, capsule or the meniscus, or both, and produces a weakness of the joint that may be associated with an audible noise when eating.

More severe injury may produce dislocation of the mandibular joint. Forward, backward, and upward dislocations are distinguished. Diagnosis is made by clinical signs and x-ray examination. In forward dislocations the treatment is reduction, often under general anesthesia, to effect complete relaxation of the muscles, and the application of an appliance to limit motion for a few weeks. In case of backward and upward dislocations a rubber plate inserted over the teeth may be used to keep the condyle out of the joint fossa until the tissues have been restored to normal.

Fractures of the condyle occur more frequently than statistics indicate. In case of multiple fractures a collum fracture of the mandible may be easily overlooked. Careful x-ray examination from various positions is necessary for a complete diagnosis, as this fracture often is associated with forward, medial, or lateral displacement of the neck of the condyle, or with medial or lateral dislocation of the head of the condyle.

The fracture can generally be reduced by manipulation under ether, after which intermaxillary ligation or the use of a splint is employed to immobilize the jaw. If there is marked displacement of the neck, or in cases of dislocation of the head of the condyle, open reduction may have to be resorted to in order to avoid malocclusion and associated masticatory difficulties. This is effected

through an incision along the lower border of the zygomatic arch. The condyle can be pulled into position with a hook while the ramus is pressed down by an assistant.

In cases of traumatic destruction of the joint, or in untreated cases which have become ankylosed, osteoarthrotomy may be indicated.

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CORRECTION OF BIRD'S FACE

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THE resection of a part of the maxilla for prognathism is technically quite difficult. If teeth are missing the operation is simpler, the simplest being when one or two premolars on both sides are missing. From the spaces where these are missing, a piece of the jaw bone is resected, and the front part of the jaw is moved backward by turning and pushing until the teeth are placed in their normal position.

This resection is made with a chisel from the alveolar process above the missing teeth, continuing in the palate, obliquely upward but inclining forward as much as possible.

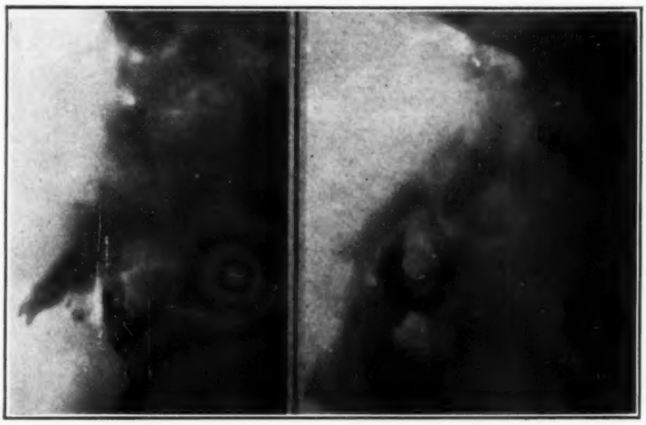


Fig. 1. Fig. 2.

Immediately after this, the dentist must make a prosthetic restoration to fix the front teeth and the front jaw pieces in their natural position.

In 1920 in Berlin I operated on a patient with a pronounced case of prognathism, and obtained a most successful result. Fig. 1 shows the case before operation, and Fig. 2 shows the case after operation. Figs. 3, 4, and 5 show the plaster of Paris models of the jaws and their articulation before the operation. Figs. 6 and 7 show the jaws and their articulation after healing. Figs. 8 and 9 show the patient before and after the operation. I shall not deal here with the operations which were performed on the patient's face.

The procedure used was one which I devised, and was a rather complicated intervention. I took advantage of the almost completely missing alveolar process of all the premolars, and with a chisel I removed a piece of the remaining alveolar process and the palate, so that the front part of the palate was separated one-half inch from the back part.

*Plastic surgeon.

Fig. 3. Fig. 4. Fig. 5.

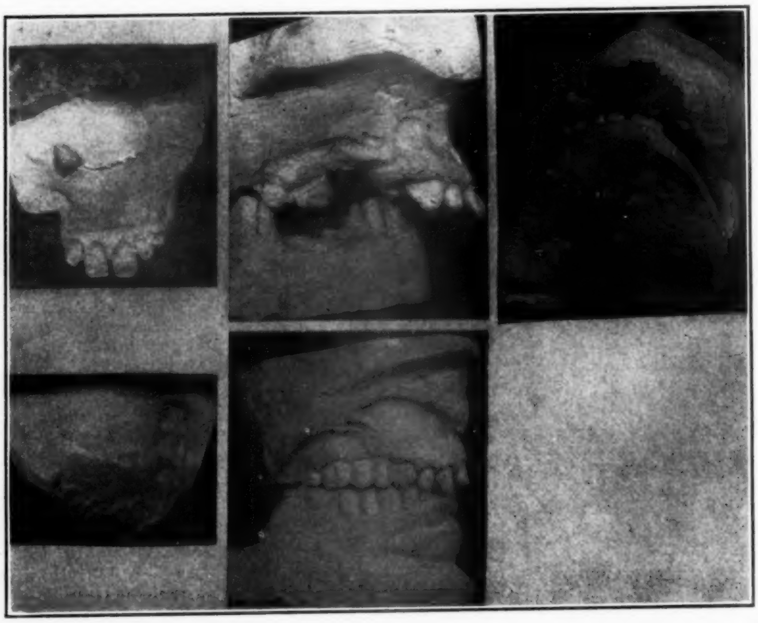


Fig. 6. Fig. 7.

Fig. 8.

Fig. 9.

I took care not to damage the underlying periosteum cover and mucous membrane of the palate, which had previously been separated. Next the chisel cut the joint of the front part of the palate, the vomer, and the maxilla so that the alveolar process of the front teeth became quite mobile and could be turned and pushed into a normal position.

I ordered a rather complicated dental apparatus from a young and clever dentist, to fix the mobile part of the jaw in the desired position for several weeks. The result was astounding both as to position and as to the growing together of the fractured parts of the jaw.

I now wish to describe a case representing the type known as "bird's face," which is shown by all those who have lost the chin or whose mandible has been

Fig. 10. Fig. 11. Fig. 12.

small from birth. Fig. 10 shows the patient's condition at the beginning of treatment. One sees the profile of the lower lip extended in a straight line down to the neck.

A transverse incision was made, 1½ inches long, behind the line which forms the outline of the chin. Through this incision an epithelial inlay was introduced into the chin in order to form an epithelialized cavity in which later on a dental prosthesis had to be placed. This epithelial inlay consists in taking an exact model of wounds where free skin grafts are to be used, this model being taken with "stent." When the stent becomes stiff, it is wrapped in a thin Thiersch graft, taken from the thigh, the epidermis toward the wound, and replaced on the wound in exactly the same position as it was when taken. The mould is kept there for a week under firm pressure on the wound. This pressure prevents any secretion between the wound and the graft, which would loosen the already attached graft partly or entirely. When well applied, the epithelial

inlay always heals completely. The wounds on the thigh, where the grafts are taken, heal in a few days under a dry dressing or one treated with vaseline.

Fig. 11 shows the chin brought forward and filled with the epithelial inlay. Fig. 12 shows the epithelialized cavity immediately after the stent was taken away, which is shown held by a small pair of pincers, beside the chin. This cavity should not communicate with the mouth, as the inflow of saliva would seriously endanger the proper healing and might possibly cause the formation of a fistula, but it should approach the mouth as close as possible along its entire length, leaving in between only a narrow transverse strip which consists mostly of mucous membrane. This strip was to be cut away later, so as to join the

Fig. 13. Fig. 14. Fig. 15.

cavity to the mouth. The stent was replaced by a wad of iodinized cottonwool, pressed into the new cavity. Over this wad of cotton wool the cavity was closed by means of fine silver wire sutures (Fig. 13).

Four weeks later, a long transverse incision in the mouth joined the two cavities. Through this incision the ball of cottonwool was taken out, and an imprint was taken at once so as to facilitate the construction of a dental prosthesis to fill the cavity and close the chin at the same time. This apparatus was to be attached to the two remaining molars of the mandible. Figs. 14 and 15 show the final result. It is also possible (but not usual) not to open the cavity and leave the stent shut in the epithelialized pocket.

Rue Plati 45

5

ODONTOMA

W. Harry Gullifer,* D.M.D., Boston, Mass.

ODONTOMAS are benign tooth tumors consisting of enamel, dentine, and cementum, either alone or in combination.

Derived from the abnormal growth of cells of the enamel organ or remnants of the dental lamina, they may form all types of tooth structure, including pulp and peridental tissue.

A number of types of this tumor growth have been designated depending upon the structure of the mass and its differentiation.

The *complex composite odontoma* consists of a conglomerate mass of tooth structure: enamel, dentine and cementum with dentine as the predominant substance. Unerupted teeth are associated with the composite odontoma usually, but the tumor mass has no tooth form; it is an irregular arrangement of calcified tooth structure surrounded by a capsule. This type of growth occurs within the bone as a rule, although some tend to erupt in part through the mucous membrane. They develop early in life, but may remain undiscovered until later in young adult life, unless discovered by x-ray examination.

The molar region of either the mandible or the maxillae is the predominant location for the complex composite odontoma.

The *compound composite odontoma* (compound follicular odontoma) is an encapsulated tumor containing numerous teeth or portions of teeth or denticles consisting of enamel, dentine, or cementum. These growths are the result of the formation of many small enamel organs rather than a normal single enamel organ with resultant formation of varying numbers and shapes of teeth. The capsule or follicle may attain considerable size. In the larger growths the jaw may be visibly distended.

These growths develop in early life and are usually associated with unerupted teeth, although not necessarily. If aberrant enamel organs are derived from the dental lamina, there may be a full complement of normal teeth in this type as in the complex composite odontoma.

The *geminated composite odontoma* is that type in which there is fusion of two or more teeth. The fusion may be between the enamel of the teeth, but more frequently the fusion is between the cementum portions with marked overproduction of dentine in the fused mass. The teeth may be normally formed or there may be two crown portions of enamel and an enlarged, irregular root formation. Conversely, there may be one enamel organ with the formation of two dentinal papillae resulting in a single tooth crown and two fused root portions.

*Assistant Visiting Oral Surgeon, Boston City Hospital.

A common location for this type is the molar region of the maxillae. Frequently the crown of one tooth is erupted with the remainder of the mass unerupted, although in other cases both crowns are erupted with fused root formations.

The *gestant composite odontoma* is that type in which a denticle is contained within the walls of a tooth. An explanation of the origin of the denticle growing within the pulp of a tooth is to be found in the epithelial cells concerned in tooth development. Epithelial cells may become separated from the sheath of Hertwig, and as the root portion of the tooth grows, these epithelial cells are carried higher in the pulp. It is a known fact that dentine is formed only in the presence of epithelium, the epithelial cells stimulating the odontoblasts to form dentine. The tooth containing a gestant odontoma may be erupted but of unusual size due to the contained mass.

The treatment of all types of odontomas is surgical removal. In those cases developing as additional separate masses with the normal complement of teeth intact, the normal teeth need not be disturbed. Unerupted teeth associated with these tumors should be removed. After the overlying bone is removed, the odontoma mass may be removed rather readily, as a capsule separates the odontoma from the surrounding bone. Intraoral operation is indicated.

CASE REPORTS

CASE 1.—Patient, A. S., white female, age 13 years.

Diagnosis.—Compound composite odontoma of left maxilla palatal to and in region of first and second maxillary molars (Dec. 31, 1937).

History.—The past history and family history were unimportant. Patient was a normal, healthy girl with physical examination negative except for the local condition. She had had careful dental care since early childhood. Previous interproximal x-ray examination for caries did not show any abnormality.

Local physical examination of the mouth revealed an abnormality palatally in the region of the left maxillary first and second molars with a very slight opening in the mucous membrane through which might be seen a portion of a white, smooth mass resembling tooth enamel. The color of the surrounding mucous membrane was normal, and the patient did not have pain or any symptoms of discomfort.

Permanent teeth were normal in number and condition. The remainder of the mouth was normal and healthy.

Roentgen Examination.—An occlusal view roentgenogram revealed on the left side of the maxilla, two solid masses palatally and medially, to the first and second maxillary molars, which appeared to be surrounded by a capsule.

The permanent teeth from the left central incisor to the left second molar inclusive were erupted and in normal position. The left maxillary third molar crown could be discerned developing distopalatally to the second molar.

Operation.—On Dec. 31, 1937 under 2 per cent novocain-epinephrine anesthesia, an incision was made palatally distal to the first left maxillary premolar and carried toward the midline of the palate.

The mucous membrane was dissected carefully along the cervical line of the adjacent teeth posterior to the third molar region. The flap was reflected toward the midline of the palate. A thin plate of bone overlying the greater part of the mass was removed with a chisel, exposing a connective tissue capsule surrounding the masses. The use of a thin instrument permitted the enucleation of the capsule and two separate nodular masses of hard structure, which close examination revealed to be tooth structure composed of enamel, dentine, and cementum.

Fig. 1.—Roentgenogram of left maxilla, showing odontoma masses to palatal side of first and second molars.

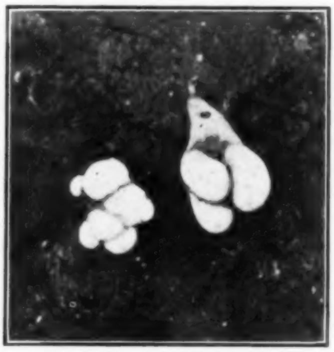


Fig. 2.—Photograph of gross specimens.

As the neighboring molars were uninvolved and intact, the flap was returned to its original position and pressed to place without drainage. Healing was uncomplicated and uneventful.

Case 2.—Patient, J. F., white male, age 48 years, was admitted to the Oral Surgery Department, Boston City Hospital, for removal of teeth and elimination of oral foci of infection.

Diagnosis.—Compound composite odontoma (atypical) of right mandible.

History.—Local physical examination revealed a generally unhygienic mouth with teeth in poor condition and many carious tooth roots.

Fig. 3.—Roentgenogram of compound composite odontoma in the body of the mandible, right second premolar region. There is a bone reaction about the tumor indicative of a tendency to further proliferation.

Fig. 4.—Photograph of gross specimen. A second tooth structure mass may be seen projecting from the cup-shaped fibrous sac surrounding the base of the odontoma.

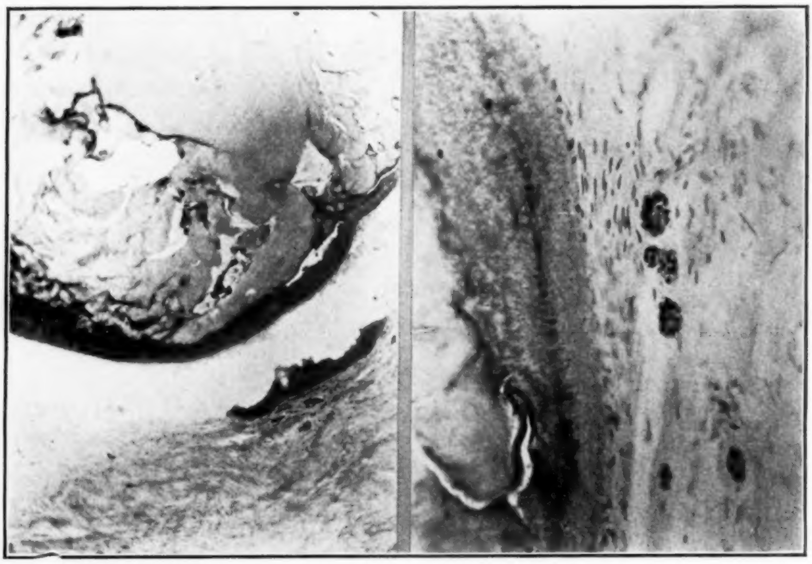


Fig. 5. Fig. 6.

Fig. 5.—Photomicrograph of specimen showing dentine, cementum (dark structure), and wall of fibrous sac (connective tissue).

Fig. 6.—High power photomicrograph of connective tissue capsule and solid structure. The solid structure consists of dentine and cementum. Note clusters of epithelial cells in capsule of connective tissue. These vestigial epithelial cells are the activators of the tumor growth.

Roentgenographic examination of right mandible disclosed beneath a bridge a curious condition resembling an inverted tooth with the root portion extending toward the ridge. From one side of the structure there appeared to be an additional formation. Around the lesion rarefaction of the bone was evident, denoting a tissue reaction.

There was marked rarefaction of the bone around the anterior teeth extending to the right mandibular second premolar, which showed root treatment and evidence of chronic infection at the apical portion. There was marked rarefaction about a right mandibular first molar root also.

Operation.—On June 18, 1937, under novocain mandibular anesthesia the infected teeth were extracted and a buccal flap was turned back. A small amount of bone was removed exposing abnormality which was removed. The flap was returned to place and a light dressing placed in the wound for forty-eight hours for drainage. Healing was uneventful.

Postoperative Diagnosis.—Odontoma.

Fig. 7.—Roentgenogram of gestant composite odontoma in left maxillary cuspid. The mass within the cuspid is slightly bifurcated. Note size of cuspid pulp canal toward the apical portion as well as area of bone rarefaction just above the enlarged cuspid. The second premolar is crowded and unerupted.

Ocular examination of the gross specimen revealed a formation resembling the root of a tooth. The crown portion, however, was not enamel but a cap of fibrous tissue. Projecting from the cup-shaped sac was a second hard structure resembling tooth structure.

Pathological Examination.—See Fig. 5.

Description.—A tooth measuring 1.5 cm. × 0.5 cm. One end was covered by a soft fibrous cup-shaped sac from one side of which projected a small solid spicule. This spicule was not directly attached to the tooth but was an outgrowth from the capsule.

Diagnosis.—Tooth with small odontoma.

Remarks.—Microscopic examination of the tissue showed the cuplike sac to be composed of connective tissue. In the wall of this connective tissue sac were numerous clusters of epithelial cells suggesting active epithelial remnants of the enamel organ. These epithelial cells were capable of further proliferation. Projecting from a portion of the cup-shaped sac was a toothlike structure composed of enamel, dentine, and cementum.

Case 3.—Patient, C. C., white female, age 12 years, was admitted to Boston City Hospital Oral Surgery Department, with complaint of recurrent swelling left maxillary cuspid area.

Diagnosis.—Gestant composite odontoma of left maxillary cuspid.

History.—Physical examination was negative except for local condition. The chief complaint was a swelling over the left maxillary cuspid which subsided and reappeared occasionally.

Roentgenogram of left maxillary cuspid area revealed an abnormally large root of this tooth and showed a solid formation within the pulpal portion of the tooth. Above the apical portion of the cuspid was an area of rarefaction in the bone denoting tissue reaction. The patient's mother refused permission for operation.

358 Commonwealth Avenue

Case Reports

It gives me great pleasure to have these cases submitted by a reader of the JOURNAL, Dr. Cyro A. Silva, a graduate of the University of Southern California and the University of Pennsylvania, who is practicing in São Paulo, Brazil. He is Professor of Radiology of the Faculty of Odontology of the University of São Paulo.

Discussion of the preceding cases as well as the ones of this month is invited. Please mail your comments or contributions of new cases for publication in this department to Dr. Kurt H. Thoma, 47 Bay State Road, Boston, Mass.

CASE REPORTS NOS. 8 TO 13

FACIAL CLEFT OR FISSURAL CYSTS

DR. CYRO A. SILVA, SÃO PAULO, BRAZIL

Dr. Silva writes that he is a constant reader of the American dental literature, that he is familiar with the articles on nasopalatine cysts published by Austin, Gardner, and Stafne, and that he has read the article published by the editor in this JOURNAL, entitled "Facial Cleft or Fissural Cysts" (**23**: 83, 1937), as well as the description of these cysts in *Oral Diagnosis and Treatment Planning* (W. B. Saunders Company, 1936).

These articles, he states, helped him to understand some unusual cyst cases that he could not diagnose before, and he was kind enough to send roentgen prints of six of his cases, with short histories. These are indeed helpful for a more complete study of fissural cysts which, not of odontogenic origin, are rare. We are greatly obliged to Dr. Silva for this contribution.

CASE NO. 8

The roentgenogram (Fig. 1) shows a cystic area discovered in routine examination. It is located between the canine and the lateral incisor. It projects between the roots almost to the alveolar crest. There were no symptoms, no history of trauma, and the pulp test was positive for both teeth. The diagnosis made by Dr. Silva is globulomaxillary cyst (the editor agrees).

CASE NO. 9

The patient had no complaints or symptoms. Roentgen examination revealed a large cystic area extending between the roots of the canine and the lateral incisor at the embryonic junction of the globular and maxillary processes. The diverging of the roots is caused by the pressure of the developing cyst (Fig. 2). Both teeth gave positive pulp tests. Diagnosis: globulomaxillary cyst.

Case No. 10

The roentgen film (Fig. 3) is from a case operated on in 1931. At the operation the cyst sac was removed and the bony wall inspected. There was no communication of the cyst with either the canine or the lateral incisor, whose root had been filled. The diverging of the roots, the location, and the extension to the alveolar crest are typical. Diagnosis: globulomaxillary cyst.

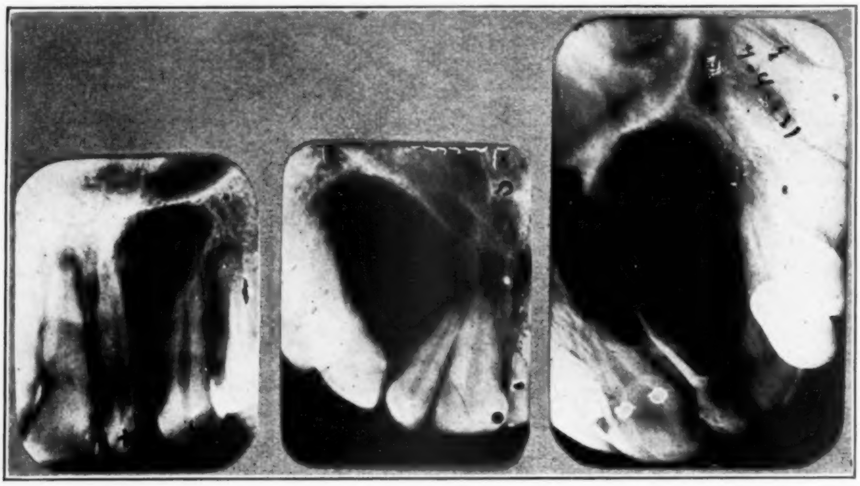
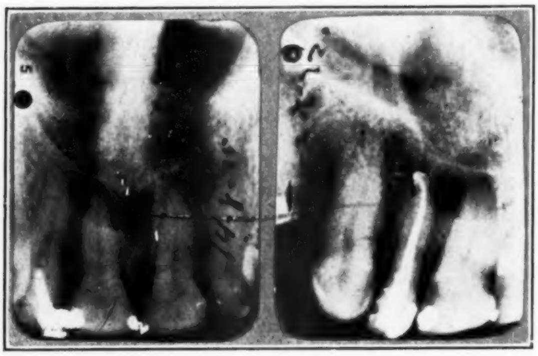


Fig. 1. Fig. 2. Fig. 3.
Figs. 1, 2, and 3.—Three cases of globulomaxillary cysts.



A. *B.*
Fig. 4.—Nasopalatine duct cysts.

Case No. 11

The patient complained of neuralgic pains in the nose. The x-ray pictures are shown in Fig. 4*A* and *B*. The roentgenogram shown in Fig. 4*A* was taken in September, 1935; Fig. 4*B* was taken in March, 1936, after the lateral incisor had been retreated and completely filled. The cyst was removed from the vestibular side. Dr. Silva made a tentative diagnosis of either nasopalatine duct cyst or median cyst. The editor would say that the symptoms would favor nasopalatine duct cyst. The x-ray picture is not typical of median cyst, but the

operative approach is not one that would be chosen for nasopalatine duct cyst. The cyst might be simply a radicular cyst induced by caries under the filling in the first incisor, distal side, via chronic pulp infection.

Case No. 12

In the case shown in Fig. 5 there was a fistula on the papilla palatina. All teeth were positive to the pulp test. The cyst could be easily removed, and after the operation suppuration ceased promptly. Diagnosis: cyst of the papilla palatina. The editor agrees to this diagnosis; the area shown in the roentgen film (Fig. 5) is due to enlargement of the incisive foramen, the cyst forming in the foramen and papilla rather than in the incisive canal.

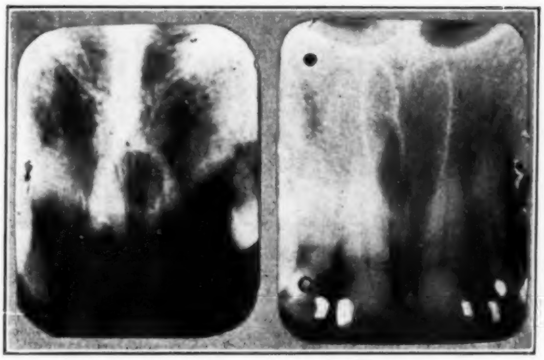


Fig. 5. Fig. 6.

Fig. 5.—Cyst of the papilla palatina.
Fig. 6.—Anatomical variation.

Case No. 13

Patient, the roentgen film of whom is shown in Fig. 6, has no symptoms. The roots of the incisors are diverging slightly, and there appears to be a cystic oval area extending between the roots. There are no clinical symptoms, and the teeth are vital. Dr. Silva asks for an opinion of this case. The editor is of the opinion that this is not a cyst of any type. The lines which are seen to extend from the floor of the nose downward may be anatomical landmarks or may be due to developmental conditions. This theory seems supported by the fact that there is another line running through the center, and one seen between the teeth near the alveolar crest. Furthermore, the area enclosed by the two curved lines is trabeculated and not of the radiolucent character that one would expect in a cyst of that size at this place. The editor has seen and investigated a similar case. When the bone was opened into, it was found to contain normal spongiosa.

Department of Orthodontic Abstracts and Reviews

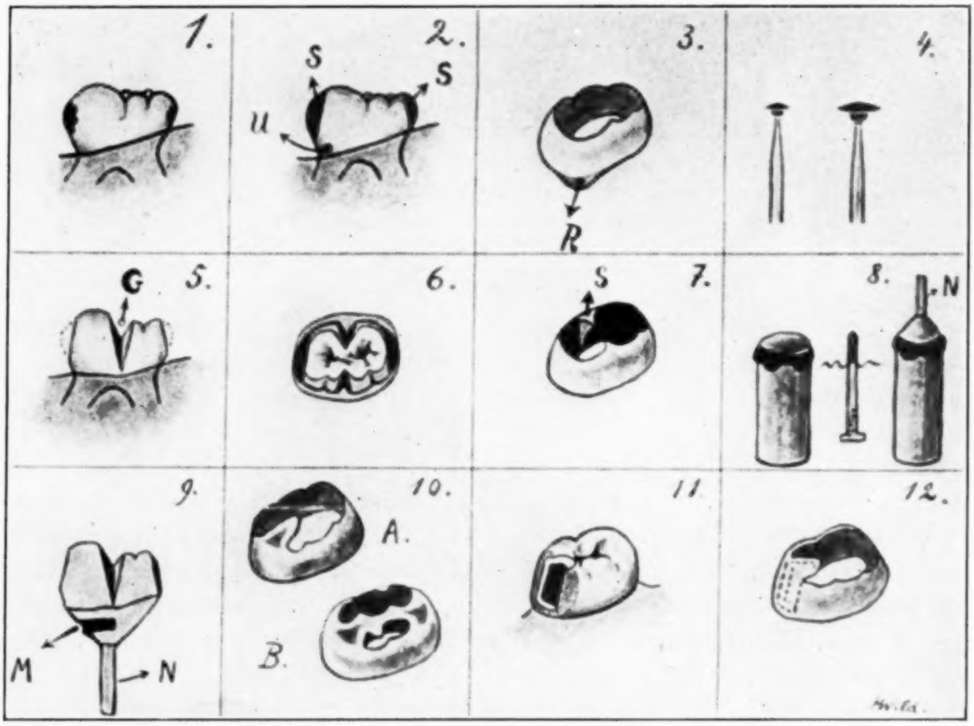
Edited by

Dr. Egon Neustadt, New York City

All communications concerning further information about abstracted material and the acceptance of articles or books for consideration in this department should be addressed to Dr. Egon Neustadt, 133 East Fifty-Eighth Street, New York City.

The Cast Band, a Permanent Restoration for Deciduous Molars and Canines. (Der gegossene Ring, eine dauerhafte und Zahnsubstanz sparende Fuellung fuer Milchmolaren und Milcheckzaehne.) By Dr. Med. Heinrich Wild, Basel, Switzerland. Ztschr. f. Stomatol. Heft 1, 1938.

In the treatment of deciduous molars and canines of children between the ages of four and six years, it is important to realize that these teeth will have



Figs. 1-12.

to function for another six or eight years. Plastic filling materials are insufficient for this purpose because the thickness of enamel plus dentine is not more than 1.4 mm. As a consequence, the necessity for a cast restoration becomes evident.

The cast circular filling for deciduous molars and canines may be defined as an inlay in the approximal walls and an onlay on the lingual and buccal

walls of the tooth, the latter walls receiving no special preparation: slice-cut preparation, when decay is superficial (see Fig. 2), box-shaped preparation, when decay is deepseated (see Fig. 11). Figs. 3 and 7 show standard forms for teeth with approximal decay and intact fissures. The form shown in Fig. 3 provides sufficient retention on big or fairly large teeth, the natural undercut U (see also Fig. 2) giving further retention. On low or tiny teeth additional retention is obtained by means of groove G (see Fig. 5), which is cut into the highest part of the buccal and labial walls with a sharp, knife-edged stone (see

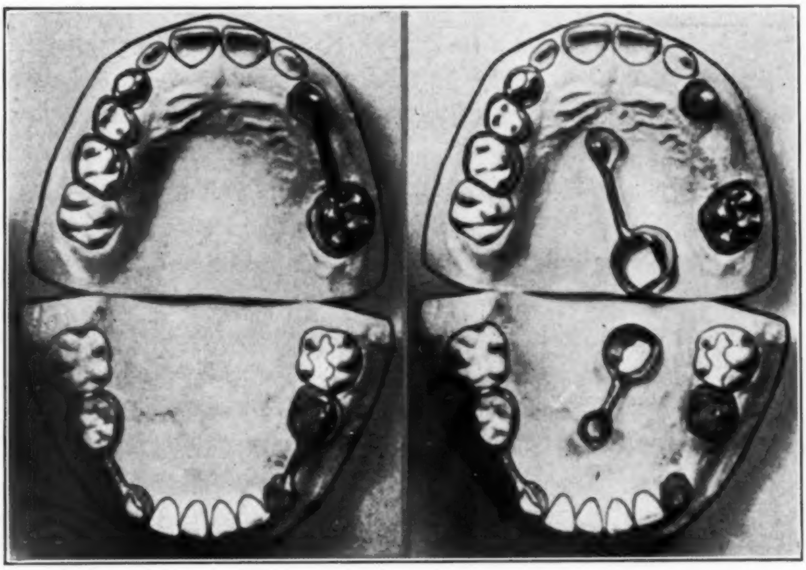


Fig. 13.

Figs. 4, 5, 6). The result of this groove is a spur (S in Fig. 7) projecting from the inside of the cast circular filling.

Decay of both the approximal walls and the fissures is dealt with as shown in Fig. 10*A* and *B* and Fig. 11. The first permanent molars may also be covered with circular castings. They need no preparation at all, being of absolutely conical shape from the time of their eruption up to the age of twelve years.

Cast circular fillings are obtained by the indirect method, i.e., copperband impressions (see Fig. 8) and amalgam dies (see Fig. 9). Full compound impressions of both jaws (*Kerr, Nadrag*) are indispensable.

The author advocates the use of rigid space retainers, without joints between the "pontic" and the "abutment teeth."

Editorials

Frank A. Delabarre

IN THIS issue of the JOURNAL there appears an article on the subject of "Indications for Early Treatment of Malocclusion" by the late Frank A. Delabarre of Boston. The paper was read on March 8, 1938, before the meeting of the New York Society of Orthodontists just one month before Dr. Delabarre's death. The article reflects an approach to the orthodontic problem that is somewhat different from the orthodox concept. It reveals many years of thought and study over the various complexities peculiar to orthodontic practice.

Dr. Delabarre's observation is focused sharply on the principle that the operator must keep in mind that the norm is changing and constantly shifting in the growing child and that an analysis and a familiarity with such changes are essential to the concept of the norm for each successive stage. His ideas of the analysis of any case within the proper age limits consist of dividing the child's life into a series of phases of dentition, each phase marked by particularly characteristic manifestations of normal growth and development, i.e., the *infantile phase* (from two to six years), *mixed dentition* (from six to nine years), and, finally, the *transitional phase* (from nine to twelve years) at the time all the teeth are erupting and taking their place in the dental arch. Dr. Delabarre stressed that there is great acceleration of the anteroposterior growth in the molar region during this latter transitional phase, with the entire facial bones moving progressively forward as a mass unit.

The more one analyzes the Delabarre observations the more it becomes apparent that his method of approach to orthodontic problems is realistic and practical. A perusal of his very last article strikingly reveals the workings of a widely experienced and practical mind. Plainly, he was casting about for a more realistic vision of the problem than one ordinarily derives from rule-of-rote and tape-measure concepts which have been so peculiar to the orthodontic viewpoint and physical appraisal.

For example, when in the mandibular arch the erupting central incisors are slightly in lingual occlusion and the lateral incisors are only slightly rotated, who can say that this arch is abnormal for this age? Who can say, convincingly, to the experienced that the case must be treated in order that the child will ultimately emerge into adulthood with normal occlusion? In instances in which such a case is in normal mesiodistal relationship, who can say with assurance that this child should be treated by mechanical means, thereby interfering with certain growth processes in other regions of the oral cavity?

The Delabarre pre-view seems to be wise in its survey of diagnostic problems when it infers that at least the orthodontist should have a clearer vision of just what is normal at a particular age and what is not. His was the approach

that obviously decrees that there are cases of what he called the mixed dentition phase when normal growth and nutrition sans orthodontic appliances are the best treatment that can be prescribed and that, on the other hand, there are other cases where it is clearly indicated that growth processes will not eventually procure the desired end. These are the cases in which the necessity of immediate treatment is clearly indicated. The orthodontist should understand his diagnosis and be able to recognize the normal from the abnormal, and should, as a result of his wide knowledge of the problem, recognize when the abnormal is but a passing phase.

Obviously there is much to be learned about orthodontic treatment aside from the manipulation and creation of mechanical devices, and there is equally as much to be learned about the diagnostic problem far remote from the traditional occlusal relations of the mesiobuccal cusp of the maxillary first molar or its speedometer-like line dropped at right angles to the Frankfort plane. One of the important things to be learned is that the orthodontic problem is essentially one of nutrition and growth; hence the operator must become more emphatically "growth minded" rather than "yardstick and caliper minded" before he may hope to comprehend fully the true significance of the orthodontic problem. Dr. Delabarre's paper is far ahead of the average concept concerning the necessity for early treatment of malocclusion.

H. C. P.

The Three Little Pigs

NOT that it means anything in particular but it at least inspires a yawn in the hot weather to learn that the Executive Board of the American College of Dentists advised the AMERICAN JOURNAL OF ORTHODONTICS & ORAL SURGERY, and also the officers of the American Association of Orthodontists, that the aforesaid board in executive session decreed that the JOURNAL and the Association must meet with certain stipulations and requirements pertaining to the publication of orthodontic literature. It stated that upon these stipulations being fulfilled, the American College of Dentists would permit its approved list of dental journals to be augmented by one more publication, namely, the AMERICAN JOURNAL OF ORTHODONTICS & ORAL SURGERY. The dead line for meeting the requirements of this ultimatum was fixed within the year 1939. This information was conveyed in a letter signed by the Assistant Secretary of the American College of Dentists, who (even though not a dentist) is said by both those outside the F. A. C. D. tent and those "in under" to be the head man and dictator of that organization.

It would have been more constructive and in better taste had the members of this executive body spent their valuable time pasting in their stamp books, in so far as the reaction of the American Association of Orthodontists and the AMERICAN JOURNAL OF ORTHODONTICS & ORAL SURGERY is concerned. The rank and file of the members of the F. A. C. D. should wake up to the harmful effects created by the continual intellectual swashbuckling of some of its elected officers

under the disguise of professional purity. The constant threat of "I'll huff and I'll puff till I blow your house down" creates nothing constructive but only foments rancor and at the same time tends to transform the F. A. C. D. into an eccentric three-wheeled vehicle for transporting the schemes of propaganda of its ambitious leaders with their dull axes.

It might be the part of wisdom, however, for the rank and file of dues-paying and paid-up members of the F. A. C. D. to wait until these slick propagandists discover that they are embarrassed by the burden of other people's affairs. When that happens there will be raucous hoorays and tumultuous applause from the members on the side lines of the dental profession to whom the egomania of these masterminds reacts about the same way as does the bombast of a peanut politician two days before election—it all comes from the dust bowl.

H. C. P.

News and Notes

American Dental Association

The eightieth annual session of the American Dental Association will be held in St. Louis, Mo., October 24-28.

American Dental Assistants Association

The fourteenth annual session of the American Dental Assistants Association will be held at St. Louis, October 24-28, with headquarters at the DeSoto Hotel. For further informations, address

LUCILE S. HODGE, Secretary,
401 Medical Arts Bldg.,
Knoxville, Tenn.

American Dental Hygienists' Association

The American Dental Hygienists' Association will meet October 24-28 at St. Louis.

DAISY M. BELL, Secretary,
974 Amherst Street,
Buffalo, N. Y.

Association of American Women Dentists

There will be a meeting of the Association of American Women Dentists in St. Louis, October 24-28.

ELSIE GERLACH, President,
808 South Wood Street,
Chicago, Ill.
MABEL M. DIXON, Secretary,
City Building,
Hastings, Neb.

German Dental Convention

The seventy-fifth meeting of the German Society for the Treatment of the Mouth, Teeth and Jaws is to be held October 5-9 in Berlin, Reichstagsgebaeude.

The theme of the meeting will be: "Prevention of Diseases Through Dental Science." The program will consist of the following lectures: (1) Schoenbeck: Dental Materials; (2) Schroeder: Insufficiency of the Human Dentition; (3) Wannenmacher: Principles of Filling Methods; (4) Muench: Root Canal Treatment; (5) Hammer: Oral Surgery; (6) Korkhaus: The Struggle Against Malocclusions; (7) Meyer: Teeth and Body Health; (8) Neuhaeuser: The Mouth in Its Relation to the Whole Organism; (9) Weski: Tartar as a Factor Detrimental to Health; (10) Schrickel: Psychology in the Treatment of Children; (11) Schroeder: Caries Prophylaxis.

Forsyth Dental Infirmary for Children

There will be a reunion of all graduate internes of the Forsyth Dental Infirmary for Children, Boston, at the meeting of the American Dental Association in St. Louis in October.

To make your reservation for the luncheon in honor of the founders of Forsyth, as well as its director Dr. Percy Howe and his staff, write to:

Dr. Robert A. Harris, Jr.
University Club Bldg.
St. Louis, Mo.

Texas Society of Orthodontists

The Texas Society of Orthodontists held its annual meeting in conjunction with the Texas State Dental Society at the Gunter Hotel in San Antonio on April 25.

Note of Interest

Dr. Axel Lundström announces the removal of his office to Stureplan 19 IV, Stockholm, Sweden.